ASSESSING THE EFFECTIVENESS OF A PLACE-BASED CONSERVATION EDUCATION PROGRAM BY APPLYING UTILIZATION-FOCUSED EVALUATION

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Assessing the Effectiveness of a Place-based Conservation Education Program by Applying Utilization-focused Evaluation

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Lack of personal connection to the natural world by most American youth builds reason for assessing effectiveness of conservation education programs. Place-based learning is important in helping youth understand how their personal and societal well-being are linked and dependent upon their local habitats. Across Montana 2277 students in grades 3 - 10 participate in an interactive year long fishing education program with their teachers called Hooked on Fishing (HOF).

The purpose of my study was to assess the effectiveness of HOF, a place-based conservation education program established in 1996, and modeled after the national *Hooked on Fishing, Not on Drugs* program. Using a quasi-experimental nonequivalent group study design, students received a pre-survey during the beginning of the program, a post-survey after the program, and an extended post-survey 12 to 14 weeks later. Teachers voluntarily participated in an Internet survey during May 2006, and program instructors voluntarily participated in a structured open-ended telephone interview in June 2006.

A key component of my study was the decision to conduct the evaluation process using an approach which included stakeholders in the development of the instruments to measure student outcomes. This approach is called utilization-focused evaluation and was developed by Michael Q. Patton. The motive of this approach is to promote the usability of the evaluation results. The results are considered to have a better chance to be applied by the program stakeholders to not only gauge program effectiveness, but to be used to improve the program.

Two research questions were: 1) does the frequency of outdoor experiences have significant affects on students' knowledge, skills, attitudes, and intended stewardship behaviors; and 2) does improved knowledge of local natural resources have significant affects on students' skills, attitudes and intended stewardship behavior.

Nonparametric statistical analyses calculated statistical significant results for most knowledge and skill outcomes in a positive direction of change with 2 - 3 HOF outdoor experiences. Attitudinal and intended behavior outcomes did not show similar results. Internet teacher survey and instructor interviews provided qualitative depth and insight to student self-reported responses.

DEDICATION

I dedicate this research to my husband Tom and to our daughter Anne. Tom because of his tireless and patient work to protect and educate citizens of all walks of life to conserve fish, wildlife, and their habitats in the State of Montana for present and future generations. Anne because she is a shining light of strength with youthful desire and strong conviction as a steward in her community and the natural world she has come to value but more importantly understands she is a part of.

"There must be some force behind conservation more universal than profit, less awkward than government, less ephemeral than sport, something that reaches into all time, and places where (people) live on land, something that brackets everything from rivers to raindrops, from whales to hummingbirds, from land estates to window boxes. I can only see one such force: a respect for the land as an organism; a voluntary decency in land-use exercised by every citizen and every landowner out of a sense of love for and obligation to that great biota we call America. This is the meaning of conservation and this is the task of conservation education."

- Aldo Leopold

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Problem Statement and Context

Science-based knowledge and experiential learning[1] help students understand how their personal and societal well-being are intricately linked and dependent upon their local habitats (Sobel, 1998). Sobel (2004) calls this "place-based education" which emphasizes students getting out of the classroom to learn about their personal connections to local landscapes. He defines place-based education as "the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other subjects across the curriculum" (p. 7).

Leaders in fish and wildlife agencies and conservation organizations are questioning whether their education programs are effectively meeting specific programmatic goals and objectives. As a result, they are interested in measuring participant outcomes to determine whether their specific program goals are being met or not (Seng & Rushton, 2003). Our nation's youth are being exposed to a growing number of place-based, or environment-based[2] education opportunities that provide first-hand field experiences[3] to facilitate learning about their biological and ecological relationships with local landscapes, and communities (Lieberman & Hoody, 1998). In order to reach the goals of scientific literacy as

[1] Experiential learning refers to learners interacting in an active sense with ideas and experiences (Bransford et al., 1999 cited in Loucks-Horsley et al., 2003).

[2] Environment-based education: use of the environment – from the classroom, to the schoolyard, to the local nature centers, and parks – is being used by schools as an effective means to achieve educational goals and to serve the needs of individual students (National Environmental Education & Training Foundation, 2000).

[3] Field trips and work projects in local communities that focus on natural systems and the relationships between science, people, and the environment. Experiential (hands-on, minds-on) field experiences for students that can be integrated into the school curricula.

stated by the National Science Education Standards (1996), these programs and learning opportunities must be considered effective and correlated to the standards. The motivation for scholars and practitioners is to help students meet academic standards while "helping them acquire personal and professional skills that will help them be contributing citizens" (Plumb, 2003, p. 2). Therefore, the operative question is whether enhanced knowledge, understanding, and skills gained through place-based educational experiences can help youth develop intended behaviors that are based on understanding the interdependencies between themselves and nature. Intended behaviors that are rooted in shared and sustainable[4] use, and stewardship[5] of natural resources. This question is imperative because

> Billions of dollars are spent annually on nonformal[6] and nontraditional education programs, and collaborative formal[7]. . . efforts. Public and private dollars fund literally thousands of programs, and yet the field of program evaluation to date has provided little guidance for evaluating such efforts. There are few resources available to lead program administrators,

[4] Sustainable is characterized by a practice that sustains a given condition, as economic growth, or a human population, without destroying or depleting natural resources, polluting the environment, etc. (Agnes, 1999).

[5] "Stewardship is the moral obligation to care for the environment and the actions undertaken to provide that care. Stewardship implies the existence of an ethic of personal responsibility, an ethic of behavior based on reverence for the Earth and a sense of obligation to future generations. To effectively care for the environment, individuals must use resources wisely and efficiently, in part by placing self-imposed limits on personal consumption and altering personal expectations, habits and values. Appropriate use of natural resources within the stewardship ethic involves taking actions that respect the integrity of natural systems" (Dixon et al., 1995, p. 42-43, cited in Siemer, 2001).

[6] Nonformal education proceeds in a planned but highly adaptable way in institutions, organizations, and situations outside the sphere of formal schooling; for example, field trips and museum visits, and other such activities (Tamir, 1991).

[7] Formal education is associated with teaching in a school classroom, and is compared to nonformal education which in simple terms occurs outside formal classrooms (Norland, 2005).

staff, and evaluators through the maze of programs and the diversity of the constituencies that support them (Norland & Somers, 2005, p. 1).

In 2004, the International Association of Fish and Wildlife Agencies (IAFWA) - now called the Association of Fish and Wildlife Agencies (AFWA) - held a "national conservation education summit" to develop a strategic vision for development and implementation of conservation education programs in state fish and wildlife agencies, and associated federal and non governmental organizations in the 21st century. The premise was built upon the need to make available effective conservation education opportunities for youth which provide first-hand field experiences to facilitate learning about peoples' biological, ecological, social, and economic relationships with nature. The summit brought together state fish and wildlife agency personnel and stakeholders from federal agencies and nongovernmental organizations to discuss current educational trends, hear from experts on the future of education, and present current understanding of best practices and, most importantly, chart a strategic course for the next decade for conservation education programs.

One of over 400 current conservation education programs implemented by state fish and wildlife agencies is the national *Hooked On Fishing - Not On Drugs*® (HOFNOD) program developed and put into action by the Future Fisherman Foundation. The program's mission is to promote and educate the public about sport-fishing, with the aim of increasing participation in fishing and resource stewardship (Fedler, 2005). The program focuses on preventing drug

use through sport fishing and aquatic resources education, and assumes that most youth do not use drugs, and activities such as fishing can divert children from drug use (Glick et al., 2002). Program activities include: (1) angling skills – basic equipment, knot tying, casting, and safety; (2) fish biology – anatomy, identification, behavior, water ecology, and habitat; (3) human dimensions – human impact on the environment, fishing regulations, ethics, conservation, management of resources, and stewardship of the environment; and (4) life skills development – decision making, peer and community relationships, problem solving techniques, setting goals, strengthening parental relationship, and making the commitment to remain drug free. The program is most commonly taught in physical education classes.

In 1996, Montana Fish, Wildlife and Parks (MFWP) adopted the national program, but crafted and implemented a state specific program framework to meet the needs of their local and regional partner organizations, participating schools, and teachers. The program was called Hooked on Fishing (HOF) and was coordinated by the agency's Conservation Education Division's Angler Education Specialist stationed in Helena, Montana. The goals of the HOF program in Montana were: (1) to introduce students, teachers, and parents to the fish and aquatic resources of Montana; and (2) to promote fishing and outdoor recreation. The objectives were: (1) to help students develop awareness and appreciation for the fish and aquatic resources in Montana; (2) to help students develop an interest in fishing and outdoor recreation; (3) to teach safe and

responsible outdoor skills; and (4) to help teachers develop skills and interest in teaching natural resource topics.

The HOF program provided an opportune test case to: (1) determine how a state agency's conservation education program was effectively providing science-based field experiences, skills, and content for teachers interested in using outdoor and classroom environments for teaching; and (2) assess desired student outcomes - knowledge, skills, attitudes, and intended behaviors - related to fish in Montana, their aquatic habitats, and local conservation and stewardship.

Statement of Purpose and Objectives

Students participate with their teachers in nonformal conservation and environmental education[8] programs – Project WILD, Project Learning Tree, Project WET, Leopold Education Project, etc. – focused on fish, wildlife, and their habitats. Distinctions between, and different uses of the terms "conservation" and "environmental education", are often discussed and debated by education practitioners relative to making the educational process operational. Charles (1986) eliminated the need to make a distinction by defining the two terms as: "[c]onservation and environmental education may be defined as a process by which learners of any age acquire and develop awareness, knowledge, skills, attitudes, experiences, and commitment to result in informed decisions, responsible behavior, and constructive actions affecting the environment" (p. 515). I concur with Charles' definition and use the two terms interchangeably.

[8] Conservation education seeks to increase individuals' knowledge, attitudes, and enhance other characteristics to promote environmentally responsible behavior (Disinger, 1983, cited in Zint, 2002).

Effective conservation requires understanding what natural resources are, the importance of their management, and what they add to the quality of life. The development of personal values that help give humans purpose to sustain and wisely use these resources and services for future generations necessitate that a majority of people understand the fundamental relationships between nature and humans. Ultimately, healthy lands and quality life depend on people understanding, valuing, and acting as a part of nature and not apart from nature.

Funders of programs and the conservation community should be obligated to evaluate the effectiveness of the maze of conservation education programs. Continued improvements and development of new pathways to more effectively accomplish the goals of education programs based on measurements of associated participant outcomes, are critical to achievement of associated objectives.

My purpose was to use summative evaluation to determine the effectiveness of place-based conservation education program outcomes. Summative evaluation helps determine program effectiveness, efficiency, and whether intended benefits are met (Scriven, 1991, cited in Rossi, 2004). Following guidelines for a user-oriented participatory evaluation approach (Patton, 1997); I developed a process for evaluating conservation education programs and means to implement practical and transferable assessment tools to help determine if program activities produce desired participant outcomes. The study objectives were:

1. To determine the effectiveness of a place-based conservation education program (HOF) by assessing student knowledge, skills, attitudes, and intended behaviors to foster responsible use of natural resources;
2. To determine if none, one, or more than one field experience(s) included in place-based conservation education program (HOF) enhanced student knowledge, skills, attitudes, and intended behaviors;
3. To develop an evaluation process, and accompanying assessment tools, based on the utilization-focused evaluation approach (Patton, 1997), to provide empirical results useful to determine place-based conservation education program effectiveness.

The HOF program was used as a test case. It had been considered subjectively successful by teachers who had used the program over the past 10 years throughout Montana (Montana Fish, Wildlife & Parks, 2000).

Research Questions

In order to objectively assess the effectiveness of HOF, I considered these student outcomes: knowledge, skills, attitudes, and intended stewardship behavior as they pertained to the scope of the program. The intent was to answer these questions:

1. Does the frequency of field experiences in a place-based conservation education program significantly affect students' knowledge, skills, attitudes, and intended stewardship behavior?
2. Does improved knowledge of local natural resources significantly affect students' skills, attitudes, and intended stewardship behavior?

Scope of the Study

Science-based learning is systematized knowledge derived from observation, study, and experimentation carried out to determine the nature or principles of what is being studied (Agnes, 1999). Over the past 30 years, many education researchers have studied the effects of science-based outdoor learning on student knowledge, attitudes, and behaviors, environmental awareness and understanding of natural and cultural systems, and students' conceptions of ecology and environmental issues in specific geographic locations (Blank, 2000; Brody, 1996; Bybee, 1993; Hungerford & Volk, 1990; Jaus, 1982; Milton et al., 1995; J. M. Ramsey, 1993; J. M. Ramsey et al., 1992; Simmons, 1991; Stapp, 1965; Volk & Cheak, 2003). Primarily these studies focused on qualifying and quantifying effects of environmental and conservation education on student knowledge gains, attitude change, and behaviors mostly in classroom settings. More recently, evaluation studies have considered what conservation education program components might enhance environmentally responsible behaviors (Zint et al., 2002).

Researchers have attempted to use evaluation studies to determine how to apply the theoretical and empirical findings concerned with student learning and responsible environmental behaviors in classroom or outdoor settings to assist educational reform of science content, programming, and teaching practices. The National Science Education Standards (National Research Council, 1996) were developed as a result of efforts to reform science education, and for the purpose of standardizing the criteria used to select curricular

materials and activities, and to judge their quality. The primary goal of the standards is for students to achieve scientific literacy, provide the means to gain knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity (National Research Council, 1996). "Scientific literary includes gaining specific abilities to enable students to use scientific principles and processes in making personal decisions and to participate in discussions of scientific issues that affect society" (National Research Council, 1996, p. ix).

Conservation education programs exist in every state in the United States and are conducted by state and federal natural resource agencies, conservation organizations, and other community based educational entities such as museums and nature centers. A recent nationwide inventory of state, federal and nongovernmental conservation education programs was conducted by D.J. Case and Associates in 2005 for the purpose of gaining a preliminary understanding of the numbers and types of entities offering conservation education programs. The 2005 inventory included 458 different programs conducted by 138 different groups. Of the 458 programs, 80% were conducted by state fish, wildlife and conservation agencies; 2% by federal fish and wildlife agencies and the USDA Forest Service; and 18% by nongovernmental organizations (C. Mycroft, personnel communication, February, 2007).

My purpose was to assess, as a test case, the effectiveness of one of the many conservation education programs, and to develop measures and a process for evaluating other such programs with some common methodology. I assessed

the effectiveness of a state specific conservation education program (in Montana) in 70 different schools, and 132 classrooms.

The survey questions targeted outcomes which helped to describe program effectiveness. These outcomes were selected primarily because of their connection to national evaluation reports of youth participant outcomes from fully implemented HOFNOD programs conducted by Dr. Tony Fedler[9] (2004, 2005) for the Recreational Boating and Fishing Foundation and the Future Fisherman Foundation. It is significant that the outcomes can be correlated with state and national science content standards for science education and the North American Association for Environmental Education Guidelines for Learning - Pre K-12 (1999). In addition, the outcomes are related to the primary goals of the AFWA national conservation education strategy (Association of Fish & Wildlife Agencies, 2005).

Significance of Study

Using local environments to connect individuals with their surroundings has been studied by Kellert (1996) who suggested that "[p]eople need to learn about the connection between human life and the health and abundance of the natural world not just cognitively but emotionally and in terms of value as well" (p. 211). Louv (2005) suggests in his most recent book, *Last Child in the Woods: Saving our Children from Nature Deficit Disorder*, that "our society is teaching young people to avoid direct experience in nature" (p. 2). He indicates that outdoor experiences in nature for young children have advantageous effects on their health, especially Attention Deficit Disorder, and depression. What does

[9] Dr. Tony Fedler, Human Dimensions Consulting, Gainesville, FL

Louv mean when he states that “direct experience” is what society is teaching young people to avoid? Kellert (2002) distinguishes “direct experience” as an unplanned, unstructured experience a child has with nature such as spontaneous play or activity in environments outside and independent of human construct. He compares “direct experience” with “indirect experience” which involves formally planned and organized programs with complimentary activities. If, our nation’s youth are being encouraged by society to avoid direct experiences with nature (Louv, 2005), then it is even more important to be able to measure the effectiveness of place-based conservation education programs designed to provide outdoor experiences for youth to learn how their personal lives and other people in their communities change in terms of interactions with local outdoor environments.

The state of affairs is not new to the general public. In December 1907, the President of the United States – Theodore Roosevelt – made the following statement in his message to Congress:

> To waste, to destroy our natural resources, to skin and exhaust the land instead of using it so as to increase its usefulness, will result in undermining in the days of our children the very prosperity which we ought by right hand down to them amplified and developed (Jeffers, 1998 p. 30).

President Roosevelt’s statement made clear that ethical, shared and sustainable use and stewardship of natural resources were not common behaviors for most Americans at that time.

At present - as in the past - preservation, conservation, and restoration of our nation's natural resources increase in importance with exponential growth of human populations. Most people need to realize their joint responsibility for the environment as citizens of mutual communities using common resources and focus less on being independent consumers and producers (Freyfogle, 1998). Place-based education programs focused on conservation have been developed to help inform society about present environmental conditions, impacts of human activities, and how best to conserve and sustainably use natural resources. The fundamental process of people working together to make collective decisions in relation to how they utilize natural resources is influenced by the different values each person holds (Clark, 2002). "Conservation" (i.e., wise and sustainable use) is often, and incorrectly, equated with "preservation" (i.e., maintenance in an undisturbed or unchanging state). "Far too few education programs emphasize the interdependence of humans and nature in keeping these ecosystems utilized for the production of food and fiber for humans – along with production of wildlife and open space - resilient and productive over the long term" (J.W. Thomas, personal communication, February, 2004). Aldo Leopold (1966) made a related statement in the mid 1900's, which remains meaningful; "The problem then is how to bring about a striving for harmony with land among a people many of whom have forgotten that there is such a thing as land…" (p. 210).

To effectively learn about and contend with the complexity of natural resource issues, formal educational systems can integrate natural resource knowledge and first-hand experiences into the core content disciplines of

science, social studies, English, reading, and math. Interdisciplinary environment-based learning has been studied in 40 schools from 12 states who implemented an educational framework called the EIC Model™ - using the **E**nvironment as an **I**ntegrating **C**ontext for learning. The framework was developed by the State Education and Environment Roundtable in 1997 (Lieberman & Hoody, 1998).

Evidence from the nationwide study indicated significant improvements in academic achievement, reduced disciplinary problems, and increased engagement and enthusiasm for learning (Lieberman & Hoody, 1998). Ideally, this process of understanding begins at home with family members and friends, and continues through elementary and secondary school, and on into adult life. Place-based educational experiences focused on conservation in outdoor environments can provide local learning opportunities for youth to explore and discover what natural resources are, how they are used, and how shared use can sustain them. Effective learning opportunities are critical to connecting human population growth, consumption levels of renewable and nonrenewable natural resources, and a healthy environment.

The world's human population in 2007 is estimated to be over 6.5 billion. The United States alone has some 300 million people with a net gain – considering births, deaths, and immigration – of 1 person every 10 seconds (U.S. Census Bureau, 2001). The United States population comprises approximately 4.6 % of the people on earth. However, this small fraction of the Earth's people consume the greatest share of many natural resources from around the world,

including corn, coffee, copper, lead, zinc, tin, aluminum, wood, rubber, oil seeds, oil and natural gas (American Association for the Advancement of Science, 2005). For example, 30% of global wood production is consumed by Americans annually; however this consumption rate is higher than the nation's 22% production rate making the United States a net importer of wood (Food and Agricultural Organization of the United Nations, 2003). The United States has the largest per-capita consumption rate for many other resources resulting in the global transfer of the impacts of local choices (American Association for the Advancement of Science, 2005). Americans should understand that their collective effect on the global environment is a function of population size, per-capita consumption of natural resources (Pletscher & Schwartz, 2000), and where and how those resources are produced and disposed of.

Ira Gabrielson (1941), an early Director of the U.S. Fish and Wildlife Service, identified lack of public understanding and appreciation for the importance of natural resources to the well-being of individuals, their children, and their children's children as major impediments to conservation. He described three barriers to conservation being considered a prime value and an established common social practice: "(1) the shortsightedness of the human race; (2) the tendency to seek panaceas rather than real remedies; and (3) lack of knowledge and understanding" (p. 235). Education about conservation of natural resources, in both formal and nonformal settings, was considered vital to diminishing these barriers.

Much progress in conservation has ensued since 1941, but these barriers persist, in many ways compounded because the United States population is so much larger - and growing. Further approximately 79% of the people now live in urban centers rather than in the rural settings that once characterized our habitations (Population Reference Bureau, 2005). James R. Miller (2005) suggested that the gap between people and the natural world will widen as more people live in cities asserting that “more effort should be expended to make the natural world fundamental to people’s lives” (p. 430).

Knowledge and understanding of the local outdoor environment gained through field experience is essential to development of personal connection to the land. David Orr (1994) described growing up in a small Pennsylvania town in the 1950s and 60s. “In school I learned about lots of other places, but I did not learn much about my own. We were not taught to think about how we lived in relation to where we lived” (p. 157). Today, many conservation education programs strive to provide field-based learning experiences with the intent of developing participants' knowledge, skills, attitudes, and responsible stewardship behaviors related to natural resource use.

A steward is defined as "a person morally responsible for the careful use of… earth's resources, especially with respect to the… needs of a community" (Agnes, 1999, p. 1406). A steward can be thought of as a “protector” of natural resources, or more applicably to conservation, as a “wise user” or a “conserver” of natural resources. All humans must use natural resources to survive; therefore, the key issue in considering natural resources does not revolve around

whether to use natural resources. The issue lies in how natural resources are used in a sustainable fashion for current and future generations (J.W. Thomas, personal communication, March, 1998). Today's students might be more apt to become tomorrow's "conservationists" if introduced to and engaged in science-based field learning experiences that provide physical and visual opportunities to promote critical thinking and enhance observation and problem solving skills (Ulrich, 1993, cited in J. R. Miller, 2005).

The need for environmental literacy[10] is the goal of most environmental education programs (North American Association for Environmental Education, 1999). Developing a citizenry that is environmentally and scientifically literate is not easily accomplished. Literacy means only that the person is educated and can communicate effectively in writing. The challenge for conservation education is to go beyond attaining scientific and environmental literacy, to striving for the development of a citizenry that knows why and how to be responsible stewards of the environment, i.e., it has an ethical or normative dimension.

Effective conservation education should be considered a learning process that requires a sense of responsibility for the environment and an ethic of shared and sustainable use of resources (National Association of Biology Teachers, 1955). The educational process, then, must develop necessary skills and expertise to achieve this outcome while fostering attitudes, motivations, and commitments to make informed decisions and take responsible action (United

[10] Environmental literacy means understanding how human actions and decisions affect environmental quality and acting on that understanding in a responsible and effective manner (Archie, 2003). It also has been defined to mean having knowledge, attitudes, skills, and behaviors to be competent and responsible (Disinger and Roth, 1992 cited in Monroe, 2003).

Nations Educational Scientific and Cultural Organization/United Nations Environment Programme, 1978).

It is fundamental to provide learning experiences for teachers and students that include field studies of local habitats and fish and wildlife, so as to improve understanding of ecological relationships and means of conservation. Such learning cannot be achieved in one classroom unit or on a single field trip - nor can it be fully accomplished in science classes. Development of a philosophical understanding of what “conservation” means currently in every day life is critical (H. J. Salwasser, personal communication, October, 2005). Aldo Leopold (1949) said, “Conservation means harmony between men and land” (p. 207). A lack of understanding this relationship endures. “The problem, then, is how to bring about a striving for harmony with land among a people many of whom have forgotten there is any such thing as land, among whom education and culture have become almost synonymous with landlessness. This is the [challenge] of ‘conservation education’ ” (Leopold, 1966, p. 210). Reflecting back to Roosevelt's 1907 statement, this is a 100 year old problem.

Improved learning opportunities in all communities – rural, suburban, and urban – requires collaboration, scientific experts, natural resource managers, teachers, students, and school systems to expand science education (Loucks-Horsley et al., 2003) to include an understanding of conservation. For effective conservation education to be maximally successful it must include participatory and interdisciplinary approaches. Such might include teams formed within formal and nonformal educational systems, including local and national governmental

agencies, working in collaboration with local citizens (Salwasser et al., 1993). Learning experiences in appropriate outdoor settings can facilitate integration of scientific concepts and principles related to the National Science Education Standards (National Research Council, 1996) and associated with classroom learning and behavioral change.

In 1996, the National Environmental Education Summit was held in Burlingame, California. Judy Braus and John Disinger (1996), leaders in environmental education presented a paper that placed environmental education in the United States in historical context. They described the primary antecedents of environmental education as nature study, conservation education, and outdoor education. They pointed out that, in 1953, an association for conservation education had been formed as a result of the National Education Association's 1935 actions, which formulated and pushed for adoption of national and state laws that mandated schools to develop conservation education programs. By the mid 1990's, the Conservation Education Association merged with the North American Association of Environmental Education in response to emerging educational approaches and the increasing popularity of environmental education (Archie, 1996). Conservation education programs remain visible and active today, though increasingly subsumed under environmental education as it evolved from nature study to issues involving deterioration of the human environment (Sobel, 2004).

The National Research Council developed the *National Science Education Standards* (1996)*;* as the result of *Goals 2000*, which detailed eight goals for

education in the United States. The goal, which most caught public attention, was that students in the United States would be first in the world in science and math achievement by 2000 (Cantrell & Barron, 1994). This goal was not achieved (U.S. Department of Education et al., 2003). The *National Science Education Standards* (National Research Council, 1996) played a role in the reform of science and environmental education. As a result, educational programs such as Project WILD, Project WET, Project Learning Tree, and Full Option Science Systems have all correlated their curricula to the National Science Education Standards. The intent was that classroom teachers could validate where and how, in relation to their school curricula, the chosen activities apply, and to determine specific standards and benchmarks.

The *No Child Left Behind Act of 2001* challenged individual States in the United States to improve education by holding schools responsible and accountable for raising average student achievement scores in reading and math by 2005-06, and science by 2007-08 (U. S. Department of Education, 2004). The tests designed to quantify achievement were aligned with state content standards and achievement levels. This added impetus to national and state educational reforms and required all formal K-12 education programs to evaluate current progress and, then, to improve program elements using quality assessment tools and evaluation methods based on peer reviewed empirical research.

The Conservation Education Summit held at the United States Fish and Wildlife Service's National Conservation Training Center in Shepherdstown, West Virginia from December 7 – 9, 2004 assembled more than 200 national

conservation education leaders from state and federal agencies, nongovernmental organizations, and universities from the United States and Canada. The intent was development of a collaborative agenda for conservation education in the 21st century. State fish and wildlife agencies and partner organizations were to chart a course for conservation education. The status of conservation education was reviewed to consider future needs and develop alternative models to enhance conservation program effectiveness. A set of core concepts for what every citizen should know about the conservation of fish, wildlife and habitats now and in the future was to be developed.

The vision for the conservation education strategy was intended to help unify and strengthen the formal and nonformal conservation education efforts of the Association's member agencies and nongovernmental partners in order to strengthen conservation education programs so that an informed and involved citizenry:

- Understands the value of fish and wildlife resources as a public trust;

- Appreciates that conservation and management of terrestrial and water resources are essential to sustaining fish and wildlife, the outdoor landscape and the quality of our lives;

- Understands and actively participates in the stewardship and support of natural resources;

- Understands, accepts and/or lawfully participates in hunting, fishing, trapping, boating, wildlife watching, shooting sports and other types of resource related outdoor recreation;

- Understands the need for and actively supports funding for fish and wildlife conservation.

(Association of Fish & Wildlife Agencies, 2005, p. 1)

Five goals emerged in order to develop a common vision and language for conservation educators. The goals were: (1) elevation of the value of conservation education; (2) advancement of the Association of Fish and Wildlife Agencies' education agenda; (3) achievement of excellence in conservation education; (4) maximize partnerships; and (5) secure funding (Association of Fish & Wildlife Agencies, 2005).

Goal 3 of the Conservation Education Strategy (2005) – "to achieve excellence in conservation education" (p. 2) – was the most applicable to my study. The three underlying sub-strategies for Goal 3 were to: (3.1) base conservation education on sound education models, best practices, and guidelines for excellence; (3.2) facilitate and strengthen professional development of teachers; and (3.3) enable, assist and encourage educators to evaluate the effectiveness of programs and materials. Making progress on achieving sub-strategy 3.3 is purpose of this study. My intent is development of a means to assess student outcomes – knowledge, skills, attitudes, and intended stewardship behaviors - through evaluation methods that provide pertinent

information to program stakeholders and intended users to determine how effectively components of a place-based conservation education program meet program goals.

Measuring how these goals are attained is difficult. “. . . to be accountable for their programs, educators need to use appropriate assessment tools and evaluation methods to measure intended outcomes . . . programs need to be designed and evaluated based on the best information research and practical experience have to offer” (Seng & Rushton, 2003, p. Intro-1).

CHAPTER 2: REVIEW OF LITERATURE

Place-based Education

David Sobel (2004) defines "place-based education" as "the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other subjects across the curriculum" (p. 7).

Place-based learning provides participants opportunity to learn about their local community around the school, their homes, and town (or city). Connection of the physical environment to the educational process assists in developing an individual more aware of processes and practices that provide clean air, clean water, and healthy habitat for wildlife and humans. "Emphasizing hands-on, real-world learning experiences, [place-based] education increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens" (Sobel, 2004 p. 7).

Is the process of place-based education a means of inspiring stewardship in today's youth whose culture is increasingly shaped by the shopping mall, and music from ipods, with limited connection to the natural world? A nationwide study by the State Education and Environment Roundtable (SEER) in 1998, identified 12 states that were using an educational process described as "using the environment as an integrating context," or EIC-based learning. Each school designed its own program to include specific geographic location, resources, and student needs. Sobel (2004) refers to the process as educational "speciation,"

where teachers adapted curricula to local conditions and specific places. Such has emerged as a theoretical framework for place-based teaching that emphasizes interrelationships of school, community, and the environment - whether urban, suburban, or rural.

Conservation Education

Conservation education is a forerunner to the environmental education lineage, along with nature study, natural history, and outdoor education. The two educational movements - conservation education and environmental education - continue to exist and meld in the 21st century.

Environmental education gained momentum after the first nationally recognized Earth Day in the 1970's, and became more established after the world's first intergovernmental conference on the environment, held in 1977 at Tbilisi, in the former Soviet Republic of Georgia (United Nations Educational Scientific and Cultural Organization/United Nations Environment Programme, 1978). Many nongovernmental conservation organizations, and state and federal natural resource management agencies, still identify their educational efforts as conservation education. William Stapp (1969, cited in Hungerford et al., 2001) said, "environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward their solution" (p. 34)

"Conserve" (Agnes, 1999) means keeping "from being damaged, lost, or wasted" (p. 310), while "conservation" (Agnes, 1999) is the "act or practice of

conserving; protection from loss, waste, etc.," (p. 310). The overarching purpose of conservation education is to produce an understanding of "conserve" and "conservation" and to build collaborative, community-based means to facilitate youths' acceptance of these concepts. That understanding includes the core concepts that natural resources are to be responsibly and sustainably used so as to provide, as stated by Pinchot[11] (1947) ". . . for the greatest good of the greatest number for the longest time" (p. 326). Only then, does it seem likely that conservation will become a core value of society and a way of life for this and future generations.

Environmental Literacy

To be maximally effective, knowledge about, and concern for, a healthy environment must be provided at local and regional scales. Peoples' skills for developing awareness, understanding, and appreciation of natural and unnatural systems are best achieved when started at a pre-kindergarten age and built upon and perpetuated throughout a lifetime. The experiences can be developed through classroom (formal) and outdoor (nonformal) educational programs for individuals and families. This lifelong learning continuum and process will, theoretically, develop an environmentally literate citizenry - the desired outcome of most environmental education programs (North American Association for Environmental Education, 1999).

The North American Association for Environmental Education (NAAEE) has defined four "strands" or themes of environmental literacy: "(Strand 1)

[11] Pinchot (1947) credits Dr. W.J. McGee, head of the Bureau of American Ethnology, with defining the new policy "as the use of natural resources for the greatest good of the greatest number for the longest time" (p. 326).

Questioning and analysis skills; (Strand 2) Knowledge of environmental processes and systems; (Strand 3) Skills for understanding and addressing environmental issues; and (Strand 4) Personal and civic responsibility" (NAAEE, 1999, p. 6). The core principles that form the environmental education approach for environmental literacy are: systems, interdependence, the importance of where a person lives, integration and infusion, roots (direct experience) in the real world, and lifelong learning (NAAEE, 1999).

In 2005, Kevin Coyle updated his report *Environmental Literacy in America*: *What Ten Years of National Environmental Education and Training Foundation/Roper Research and Related Studies Say About Environmental Literacy in the U.S.* Coyle concluded that most Americans believe they know more about the environment than is actually the case.

> That is why 45 million Americans think the ocean is a source of fresh water; 120 million think spray cans still have CFCs in them even though CFCs were banned in 1978; another 120 million people think disposable diapers are the leading problem with landfills when they actually represent about 1% of the problem; and 130 million believe that hydropower is American's top energy source, when it accounts for just 10% of the total. It is also why very few people understand the leading causes of air and water pollution or how they should be addressed. Our years of data from Roper surveys show a persistent pattern of environmental ignorance even among the

most educated and influential members of society (Coyle, 2005 p. v).

If the results on the 1997 Roper survey (Coyle, 2005) are accurate what would be the results of a similar poll in 2007? Would results have changed appreciably over the past 10 years, especially since "[a]fter 35 years of effort, the environment has yet to achieve 'core subject' status in our schools" (Coyle, 2005 p. 51). Interestingly, the 1997 Roper Report Card and subsequent reports, found that 95% of American adults - including 96% of those that were parents - supported teaching students about the environment in schools (Coyle, 2005). Further, a 2000 survey, revealed that "Americans believe that an appreciation and understanding of the environment creates well rounded children who are better prepared to be part of society" (National Environmental Education & Training Foundation & Roper, 2001 as cited in Coyle, 2005, p. 65).

Environmental and conservation education should be a lifelong learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action (United Nations Educational Scientific and Cultural Organization/United Nations Environment Programme, 1978). Building environmental literacy requires an on-going effort that explicitly addresses knowledge and skills in the sciences, social sciences, and humanities, and allows repeated opportunities to apply those skills (North American Association for Environmental Education, 2004).

It is important to remember when developing skills and knowledge in the sciences that a person will acquire environmental and scientific literacy. "Scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity" (National Research Council, 1996, p. 22). A person who is scientifically literate has learned to ask, seek, and determine solutions to questions derived from their natural curiosity about the world around them.

Theoretical Framework

Learning Theory

Considering natural curiosity and cognitive development in the context of learning theory, pre-kindergarten is the best time to begin developing awareness and appreciation of natural and ecological systems (North American Association for Environmental Education, 1999). Jean Piaget, a Swiss developmental psychologist described this period in a child's life – 2 to 7 years of age – as the "preoperational stage" when children begin to represent the world with words, images, and drawings (Santrock, 2000). Piaget described three other periods in the development of children's gradual and sometimes vacillating ability to acquire knowledge – "sensory-motor", "concrete operational", and "formal operations" (Novak, 1977). Cognitive and affective development[12] continues throughout a life time. However, the two most applicable periods to this study are "concrete operational" – 7 to 11 years of age, and "formal operational" – 11 years and beyond. During the "concrete operational" period a child can gauge and

[12] Affective development refers to emotional learning through education (Sprinthall and Sprinthall, 1981).

manipulate relationships when comparing and contrasting real objects to make predictions and explanations. During the “formal operational” period a child is able to manipulate mental constructs to compare and contrast different relationships. Therefore, the child is able to make better interpretations due to increased language development.

John Dewey (1938) believed that a child is not an empty vessel waiting to be filled with knowledge. He advocated careful, well-guided experience for children, arranged according to their interests and capacities. Dewey’s theories changed the extant teaching paradigm from traditional teaching methods to creating a learning environment that actively engaged the children in learning. This, in turn, led to the concept of active and experiential learning (Sprinthall and Sprinthall, 1981). He also believed that forming attitudes - likes and dislikes – is as, or more, important than what is learned from math, spelling and geography lessons because developed attitudes are what must count in the future. The attitude considered the most important to cultivate was a desire for continual learning (Dewey, 1938).

Learning about the environment through experiences must, therefore, be actively constructed and accomplished through cooperative learning with others more knowledgeable or skilled, and achieved cooperatively as described by Lev Vygotsky (Wood, 1998). Novak (1977) said that Vygotsky “saw language development as the primary vehicle for higher order cognitive functioning” (p. 120). Social learning theorists have broadened the content of learning theory to

include the notion that learning changes behavior by including social behavior in social contexts (P. H. Miller, 1993).

Cognitive development has a compatible role in social development (P. H. Miller, 1993). Therefore, if cognition is to be self-perpetuated and result in the development of conservation-minded individuals (those who responsibly use natural resources, and practice stewardship), then learning about the environment in the environment should be a common practice. One of the most important parts of learning is to experience and understand the various roles that humans can and do play in their relations with other components and processes of ecosystems. Rachel Carson (1962) wrote about these interrelationships in *Silent Spring*. Her point was that human beings are not in control of nature, but are simply one of its parts, and that the survival of one part depends upon the health of all parts. Learning about and experiencing these linkages between human life and nature are essential to the growth of individuals and their understanding of both the direct and indirect connections between parts.

Are "hands-on" activities alone enough to learn science? This question was posed in the 2007 issue of *Science and Children* (Brown & Abell, 2007), the National Science Teachers Association's peer-reviewed journal for elementary teachers. Teachers who have used the "discovery learning" approach (Bruner, 1960) to help students interact with their environment to discover and develop new ideas about the world around them were frustrated because students did not learn what the teachers expected. In 1967, Karplus and Thier in the *Science Curriculum Improvement Study,* described an approach to help students learn

science called the learning cycle based on three phases of instruction: (1) *exploration*, which provides students with firsthand experiences to investigate science phenomena; (2) *concept introduction,* which allows students to build science ideas through interaction with peers, texts, and teachers; and (3) *concept application,* which asks students to use these science ideas to solve new problems (Brown & Abell, 2007).

Since Karplus and Thier (1967) developed the learning cycle new versions have been developed. One contemporary version is the 5-Es model (Bybee, 1997). This model is built around the 3 core phases, but adds "engage", to captivate student attention and uncover students' prior knowledge; and, also, adds "evaluate", so the teacher has opportunity to judge student progress and for students to be able to reflect on new understandings (Brown & Abell, 2007).

The 5-Es model contains five successive stages – *Engage, Explore, Explain, Elaborate, and Evaluate*. The learning process is based on the theory of constructivism (Brooks and Brooks, 1993, cited in Jacobson et al., 2006) which acknowledges the role direct experience and reflection play in assisting students construct new knowledge based on prior knowledge, and helps eliminate misconceptions they may have developed.

The 5 stages are defined as:

<u>Engage</u> – engage the learner with an event or a question. The activity(s) captures the students' attention and helps to make connections to things they have interest in and are familiar with. This stage:

- Creates interest.

- Generates curiosity.
- Raises questions.
- Elicits responses that uncover what the students know or think about the concept or topic.

Explore – explore the concept through hands-on experiences. The learner receives little explanation and is introduced to only a few terms during this stage, as they are intended to define the problem or phenomenon themselves. During this stage, the student(s) acquire a common set of experiences, and, then, help each other make sense of the concept. The teacher acts as a facilitator. This stage:

- Encourages students to work together without direct instruction.
- Observes and listens to student interactions.
- Asks probing questions to redirect students' investigations when necessary.
- Provides time for students to puzzle through problems.
- Acts as consultant for students.

Explain – explains the concepts and defines the terms. The curriculum provides the definitions and explanations for the concept being studied. This stage:

- Encourages students to explain concepts and definitions in their own words.
- Asks for justification (evidence) and clarification from students.
- Formally provides definitions, explanations, and new labels.
- Uses students' previous experiences as basis for explaining concepts.

Elaborate – elaborate on the concepts. Further activities are conducted to elaborate a better understanding of the concepts; group work is best. Students construct a deeper understanding of the concepts when discussing their ideas with others. This stage:

- Expects students to use formal labels, definitions, and explanations provided previously.
- Encourages students to apply or extend concepts and skills in new situations.
- Refers students to existing data and evidence and asks, “What do you already know about…? Why do you think about…?”

Evaluation – evaluate the student’s understanding of the concepts. This stage is designed for the students to continue to develop their understanding, and to determine what they know and what they still need to learn. This stage:

- Observes students as they apply new concepts and skills.
- Assesses students’ knowledge and skills.
- Looks for evidence that students have changed their thinking or behaviors.
- Allows students to assess their own learning and group-process skills.
- Asks open-ended questions such as “Why do you think . . .? What evidence do you have? What do you know about . . .? How would you explain . . .? Why do you think you know what you know?"

Behavioral Theory

Fundamental to effective conservation programs are pedagogical (teaching) methods that include: hands-on activities; relevant subject matter; and topics and teaching strategies that engage students, and encourage their active participation in the learning process (Hoody, 1995).

Research in environmental education indicates that attention to inputs in a learner's experience, such as an organized field trip to a local wildlife refuge, can lead to responsible environmental behavior (Hungerford and Volk, 1990). A commonly expressed goal of environmental education programs is encouragement of environmentally responsible behaviors (Simmons, 1991). A traditional learning model is based on the assumption that "if we make human beings more knowledgeable, they will, in turn, become more aware of the environment and its problems and, thus, be more motivated to act toward the environment in more responsible ways" (Hungerford and Volk, 1990, p. 9). The model in Figure 1 illustrates this assumption. This model of traditional learning has linked knowledge to attitudes and attitudes to behavior. The research in environmental behavior has been productive, often only focused on one variable, but has not demonstrated the validity of the linear model for changing behavior (Hungerford and Volk, 1990).

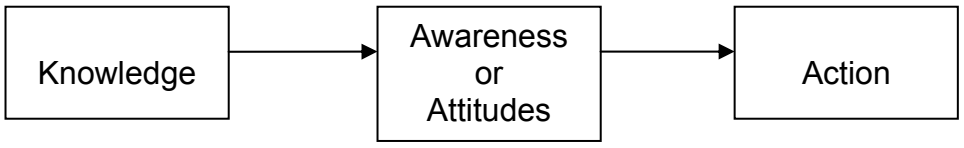

Figure 1. Behavior change system (Hungerford and Volk, 1990).

A meta-analysis of the literature related to responsible environmental behavior in environmental education was conducted by Hines, Hungerford and Tomera (1986-87). The researchers analyzed 128 studies that had been reported since 1971. The purpose of the meta-analysis was to: (1)identify the variables which were most strongly associated with environmentally responsible behavior; (2) to determine the relative strengths of the relationships between the variables and behavior; and (3) to formulate a model (Figure 2) of responsible environmental behavior representative of the findings (Hines et al., 1986-87).

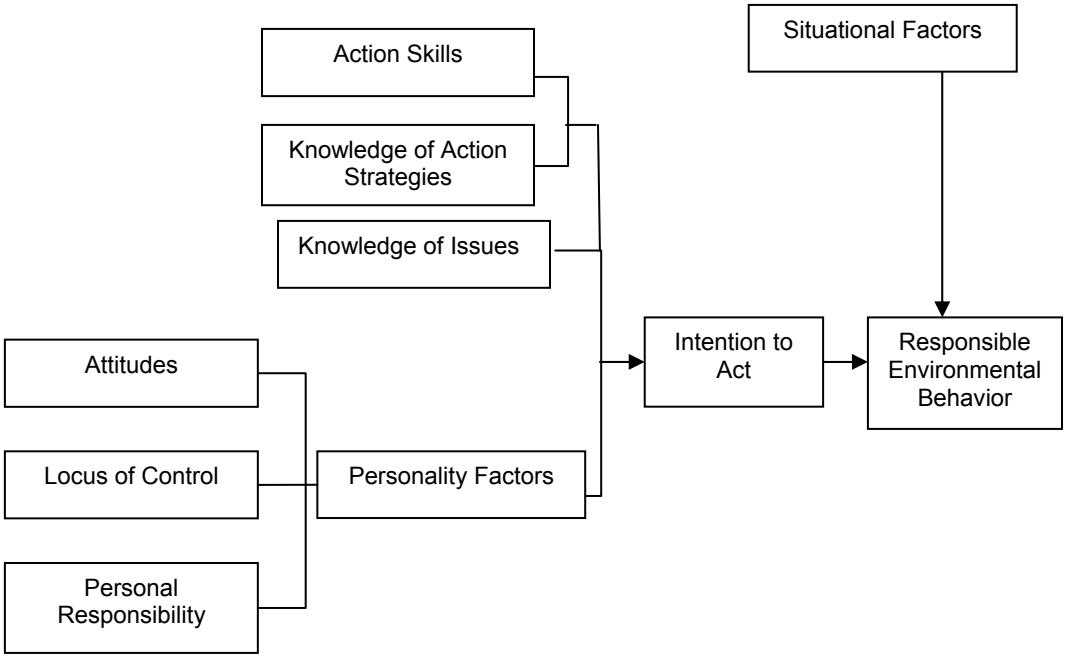

Figure 2. The Hines model of responsible environmental behavior.

Note. This model was adapted by Hungerford and Volk (1990) from Hines et al. (1986/87) to reflect the connections between attitudes, locus of control[13], and personal responsibility.

[13] Locus of control refers to an individual's belief in being reinforced for a certain behavior. Locus of control can be either "internal" or "external". A person with "internal locus of control" expects to experience success or somehow be reinforced for doing something. A person with "external locus of control" does not believe they will be reinforced for doing something and, therefore, probably will not do it (Hungerford and Volk, 1990).

Hungerford and Volk (1990) summarized the inferences Hines et al. made after completing the model. The following inferences are pertinent here:

- An individual who expresses an intention to take action will be more likely to engage in the action than will an individual who expresses no such intention…However, …it appears that intention to act is merely an artifact of a number of other variables acting in combination (e.g., cognitive knowledge, cognitive skills, and personality factors).
- Before an individual can intentionally act on a particular environmental (or conservation) problem, that individual must be cognizant of the existence of the issue. Thus, knowledge of the issue appears to be a prerequisite to action.
- A critical component is skill in appropriately applying knowledge to a given issue. [A]n individual must possess a desire to act. One's desire to act appears to be affected by a host of personality factors…locus of control, attitudes, and personal responsibility.
- Situational factors, such as economic constraints, social pressures, and opportunities to choose different actions may…serve to either counteract or to strengthen the variables in the model. (p. 10)

Hungerford and Volk (1990) reflected on the work of Hines et al. and other research studies that contributed to the literature on behavior in environmental education. They found that, when these studies were coupled with the Hines Model of Responsible Environmental Behavior (1986/87), three main categories of variables (entry-level variables, ownership variables, and empowerment

variables) were revealed. Hungerford and Volk (1990) hypothesized that these variable categories operated in a linear fashion. However, they expressed that major and minor variables within each category operated in a synergistic fashion. The main variable categories are defined as:

> Entry-level variables are good predictors of behavior and appear to be related to responsible citizenship. They include environmental sensitivity and knowledge about ecology.
>
> Ownership variables personalize environmental issues, creating individual ownership of the problem or issue. Ownership variables appear to be critical to responsible environmental behavior. They include an in-depth understanding of the issues and personal investment in and identification with the issue.
>
> Empowerment variables give human beings a sense that they can make changes and help resolve important environmental issues. They include knowledge of and skill in using environmental action strategies, locus of control, intention to act, and in-depth knowledge about issues. (p.11-12).

Fishbein and Ajzen (1975, 1980) have developed social science theories and conceptual frameworks focused on belief, attitude, intention, and (predicting social) behavior and are referenced occasionally in nonformal conservation education evaluation studies. Fishbein and Ajzen (1975) believed that information about the respondent's intentions to act can increase the ability to predict behavior. The theory of reasoned action (Ajzen and Fishbein, 1980) is

based on the assumption that humans are “usually quite rational and make systematic use of the information available to them” (p. 5). Ajzen and Fishbein (1980) argued that people consider the implications of their actions before they decide to engage in or disengage from a particular behavior. The theory of reasoned action is applicable here as the theory focuses on the goal of understanding and predicting behavior. It also assumes that intention is a function of two basic determinants, one personal in nature – the attitude toward the behavior – and the other reflecting social influence – the social pressures to perform or not perform the behavior in question (Ajzen and Fishbein, 1980).

My study focused on assessing youths' knowledge, skills, attitudes, and intended behaviors, with respect to stewardship behavior. The intent was not to predict behavior, but to collect self-reported data related to response variables or programmatic outcomes. This was done to facilitate consideration of how the subjects changed over time and to better quantify and qualify overall program effectiveness based on positive or negative change in the measured outcomes. Seimer (2001) described the “best indication that a program is successfully producing intended behavioral outcomes is a quantitative assessment that shows youth who have participated in a program have a higher propensity than other youth to express specific desired behaviors” (p. 31).

Monroe (2003) expanded the notion of linear behavior models and the perspective of promoting responsible environmental behavior by describing two strategies she considered significant to encouraging conservation behaviors. The two broadly defined strategies were: (1) employing social marketing tools (i.e.,

service learning project, or hybrid car) to change a selected behavior in a targeted audience; and (2) cultivation and nurturing of environmental literacy through selected educational programs that lead to knowledge, attitudes, skills, and ultimately - but not immediately - conservation behaviors. These strategies and the "motive for many conservation programs is to encourage human behaviors that reduce our environmental impact on the planet" (Monroe, 2003, p. 113). Together they provide a concrete reason for evaluators and practitioners to work together to ensure that the evaluation process is research based, useful, and influences change (Clavijo et al., 2005).

Evaluation Theory

According to Alkin (2004), evaluation theory is built on program accountability and a systematic process to improve the program and, ultimately, society. The three major evaluation approaches are: (1) methods – evaluation guided by research methods; (2) valuing – placing value on the data; and (3) use – focused on who will use the evaluation results, and concern for how the information will be used (Alkin, 2004).

The definition of evaluation according to Weiss (1998) is: "the systematic assessment of the operation and/or the outcomes of a program or policy, compared to a set of explicit or implicit standards, as a means of contributing to the improvement of the program or policy" (p. 4). Alkin and Christie (2004) considered Weiss an evaluation "theorist" who, with others in the field, have developed prominent evaluation approaches and models. Weiss (2004) described her methods of evaluation as practical guidelines on how to *do*

evaluation . “Doing evaluation through a process of research takes more time and costs more money than offhand evaluations that rely on intuition, opinion, or trained sensibility, but it provides a rigor that is missing in these more informal activities” (Weiss, 1998, p.5). Rigor is important when program outcomes are complex and hard to observe, decisions to be made about the program are important (and in some cases, expensive), and evidence is needed to convince program stakeholders about the validity of the conclusions (Weiss, 1998).

Rossi (2004) described his view of evaluation research as “*applied* social research” (p. 127). He stated that when applying social research methods, evaluation research can provide credible information that “can aid…in the assessment of the effectiveness…of social programs” (p. 127). Evaluation research methods must, then, establish clear questions for inquiry, collect evidence systematically from a variety of people involved in the program, translate the evidence into quantitative and qualitative terms, and, then, draw conclusions based on explicit or implicit program standards and criteria (Weiss, 1998). The empirical results are then used to demonstrate the consequences of the program, and the effectiveness in fulfilling the expectations of the program funders, managers, and participants.

Evaluation research can be distinguished from other research by the intent or purpose for which it is done (Weiss, 1998). Rossi, Lipsey, and Freeman (2004) use evaluation research interchangeably with the term “program evaluation” and define it as “a social science activity directed at collecting, analyzing, interpreting, and communicating information about the workings and

effectiveness of social programs" (p.2). Patton (1997) described program evaluation as the "systematic collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future programming" (p. 23). Whether a particular study's purpose is evaluation research or program evaluation, both are focused on the end results, or outcomes of the program for the individuals it is intended to serve (Weiss, 1998).

I evaluated a place-based conservation education program which is aimed at making a difference in natural resource knowledge gained by students, their personal attitudes and skill levels related to outdoor recreation, and intentions to behave as responsible stewards of their local natural resources. The specific program provides a practical setting to understand the relationships between a treatment and response variables. I employed a participatory evaluation[14] approach as advocated by Patton (1997). The purpose of applying this approach was to provide useful research results to those involved in promoting and implementing a conservation education program. The participatory framework advocated by Patton is called utilization-focused evaluation. This evaluation approach allows the collection of both quantitative and qualitative data. The process is a systematic collection of information about the activities, characteristics, and outcomes of a specific program.

I chose the utilization-focused approach to evaluation because it is built upon the understanding that evaluation is conducted for the purpose of the

[14] Participatory evaluation involves program participants in goal setting, establishing priorities, focusing questions, interpreting data, and work together with the evaluator to connect processes to outcomes (Patton, 1997).

intended use of the results by intended users[15] (Patton, 1997). The results of utilization-focused evaluation are used to make judgments about a program, improve program effectiveness, and/or inform decisions about future programs. Patton (2002) described that utilization-focused evaluation "should be judged by its' utility and actual use"; therefore, "evaluators should facilitate the evaluation process and design any evaluation with careful consideration of how everything that is done, from beginning to end, and how it will affect use" (p. 1). Utilization-focused evaluation is a process for making decisions about these issues in collaboration with an identified group of stakeholders and primary users – program managers, staff, and participants – focusing on their intended uses of evaluation results (Patton, 2002). The stakeholders and primary users are more likely to use the results of the evaluation if they understand and feel ownership of the evaluation process and research findings (Weiss, 1998).

This study addressed such questions like: Are participants gaining the benefits intended? And, what is happening to the participants as a result of the program's intervention? The idea of evaluation is that a qualified person examines a phenomenon (a person, place, thing, or idea) to judge its merit. The phenomenon is measured against standards or criteria to determine whether the program effectively does what it is supposed to do. Evaluating effectiveness of social interventions is currently increasing due to concern(s) over allocation of scarce resources (Rossi et al., 2004).

[15] Intended users are the individuals or stakeholders who work with the evaluator to develop the evaluation, apply the findings, and experience the evaluation process.

Summary

The established theoretical framework and literature provided evidence and interpretations to review and use as guidelines for conservation education evaluation. Fortuitously, seven years prior to this study an evaluation instrument was developed and used by MFWP to assess how satisfied the teachers were with the HOF program. This survey was conducted in the Fall of 2000, and provided a baseline for me to consider when designing and implementing a comprehensive evaluation method in the quest for empirical evidence to better define the effectiveness of a conservation education program (HOF) and how to make future improvements.

The one-page survey was sent to 120 teachers and asked them to report to what extent they “agreed” or “disagreed” with six statements about the program. The statements focused on whether they thought the program was a good thing; whether they believed the program had helped to increase students' knowledge of fishing and aquatic resources; whether they felt the program had contributed to increased parental involvement in their classrooms; whether, because of the program, their students were more likely to continue fishing in the future; whether their students spent more time learning about fishing and aquatic resources than they normally would without the program; and whether they would recommend the program to other teachers. The teachers were given space to provide additional comments if desired. The final question asked them to assign a letter grade on an A – F scale to the program-at-large (Table 1).

Table 1. Overall grades teachers gave the HOF Program in 2000.

Grade	n	Percent
A+	15	28%
A	32	60%
A-	1	2%
B+	2	4%
B	3	6%
Total	53	100%

Approximately 44% (53) of the teacher surveys were returned and results tabulated. A five-point ordered response scale was used, and ranged from "strongly disagree" = 1 to "strongly agree" = 5 with an option for "don't know" = 0. The results are displayed in Table 2.

Table 2. The average response results for the 2000 MFWP survey.

Survey Statement	$\overline{X}$ (Average Response)
Overall, the program is a good thing	4.9
The program has helped increase student knowledge of fishing and aquatic resources	4.7
Would recommend the program to other teachers	4.9
The program has contributed to increased parental involvement in the classroom	4.5
Because of the program, students are likely to continue fishing in the future	4.4
Because of the program, students spend more time learning about fishing and aquatic resources than they would without the program	4.6

Therefore, it was concluded that 44% of the 120 teachers participating in the HOF program during the 2000 school year were well-satisfied with the program. A significant number of teachers, 56% did not respond and were not sent a second survey. Depending on who is surveyed and what methods were used, a response rate of 60% - 70% is desired (Salant & Dillman, 1994). Because it is not known how the non-responders would have rated the program, the final conclusion based on the results can not be considered conclusive.

The HOF program was an opportune test case for this study for two reasons: (1) to determine, through program evaluation, how a state agency's conservation education program was effectively providing science-based field experiences, skills, and content for teachers interested in using outdoor and classroom environments for teaching; and (2) to assess, using evaluation research, whether there was a change in desired student outcomes - knowledge, skills, attitudes, and their intended behaviors - as a result of participating in a place-based conservation education program focused on fish, aquatic habitats, local conservation and stewardship.

CHAPTER 3: STUDY AREA

Geographic

This study was performed throughout Montana, the 4th largest state in the nation covering 147,042 square miles. The State (Figure 3) is 630 miles long by 280 miles wide and consists predominantly of the Rocky Mountains in the western third, and the gentle rolling Great Plains with island mountain ranges in the eastern two-thirds.

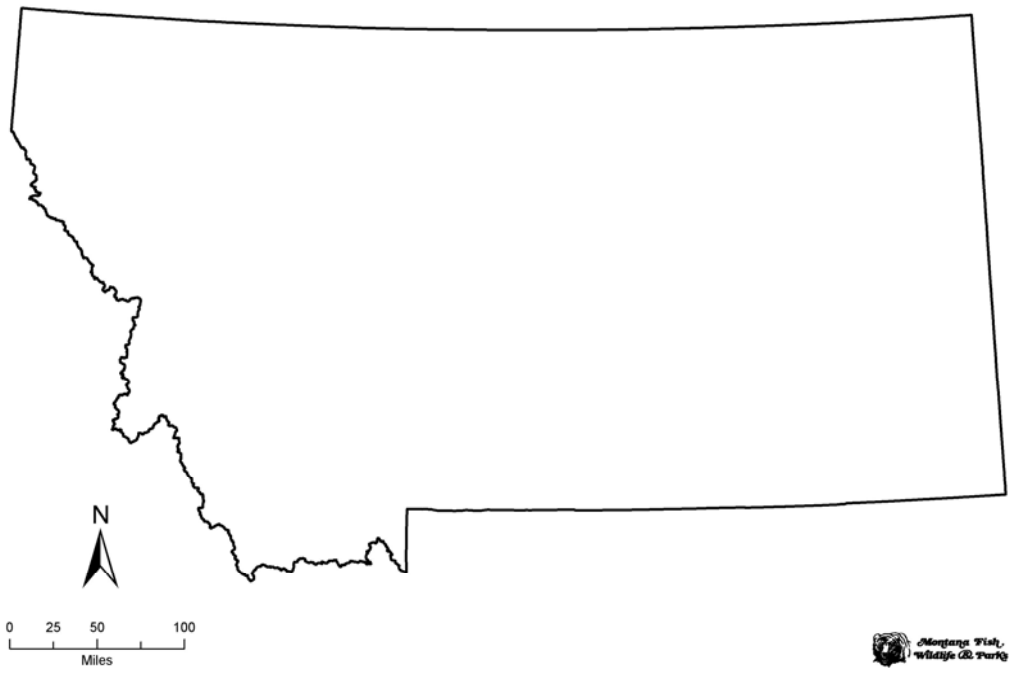

Figure 3. The State of Montana.

The opportunity to access a stream, river, lake or reservoir is reasonably accessible to people living throughout the State. For obvious reasons those

opportunities are more evident in the mountainous regions. The hydrologic map of Montana in Figure 4 demonstrates the communities within close proximity to water and therefore, more access for related recreational opportunities.

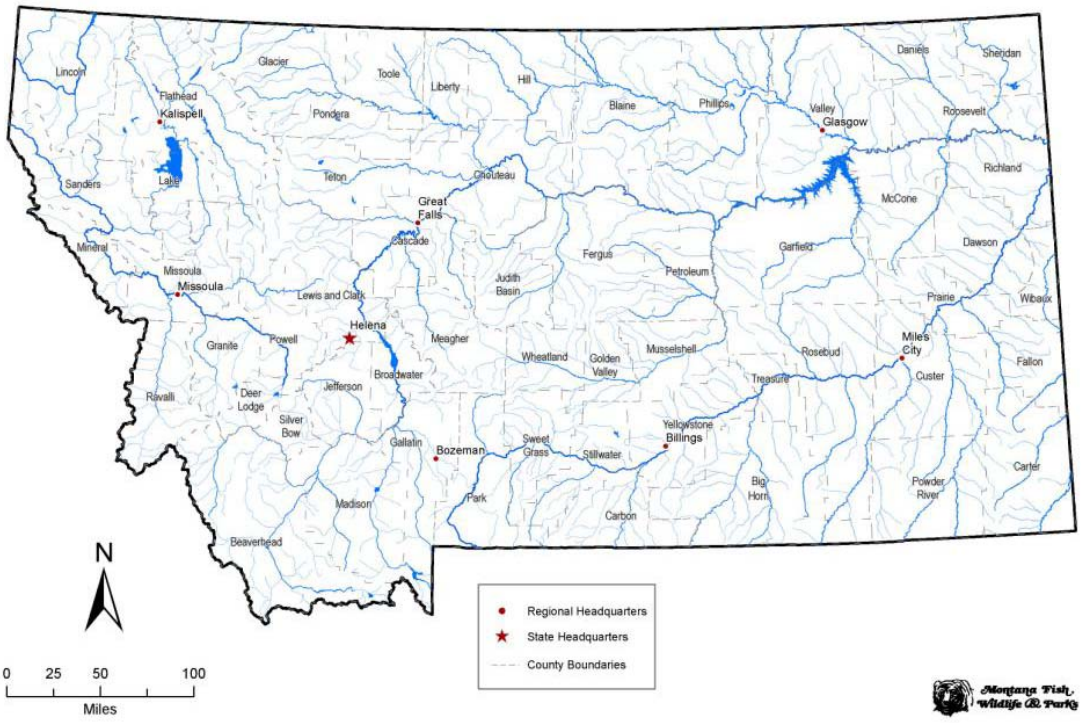

Figure 4. The hydrological map of Montana.

In 2005, the State's estimated population (Figure 5) was 935,670 people, with 6.4 people per square mile, and only six years ago just one in six was a K-12 student (Neilson, 2001).

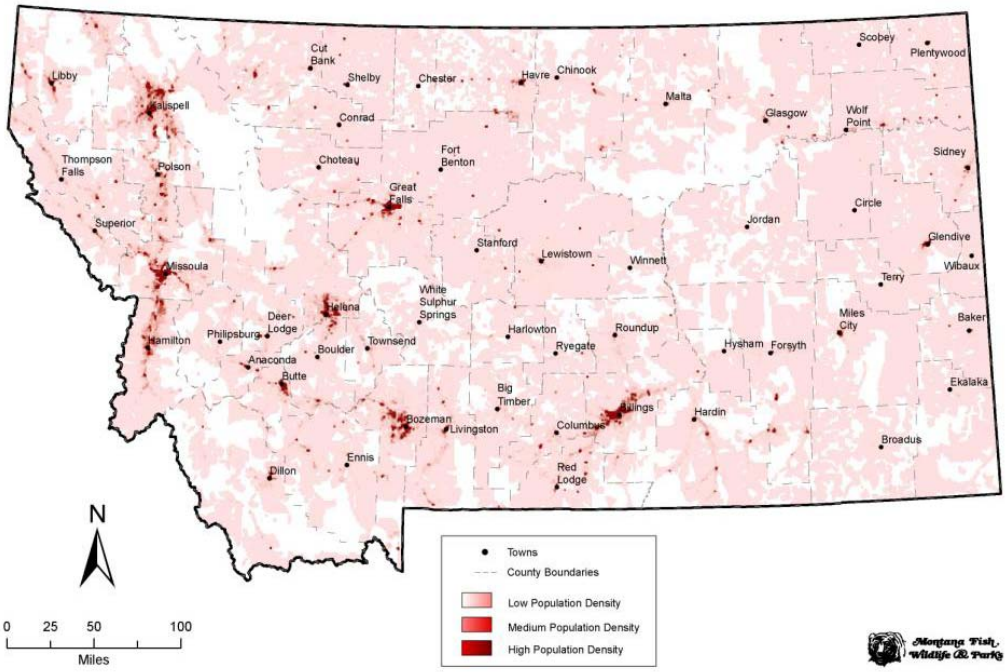

Figure 5. The population density of Montana.

In 1999, the Montana Statewide Education Profile confirmed that 53 percent of all Montanans lived in communities with 2,500 or more residents. My study included students attending 80 public and private schools located across the State in 39 communities (Table 24, Appendix A, p. 190). The majority of these students attended schools in what the United States Census Bureau (2001) would consider rural communities.

School Locations

The participating schools were located in six of the seven designated MFWP regions in the State. Figure 6 illustrates the boundaries of the seven regions.

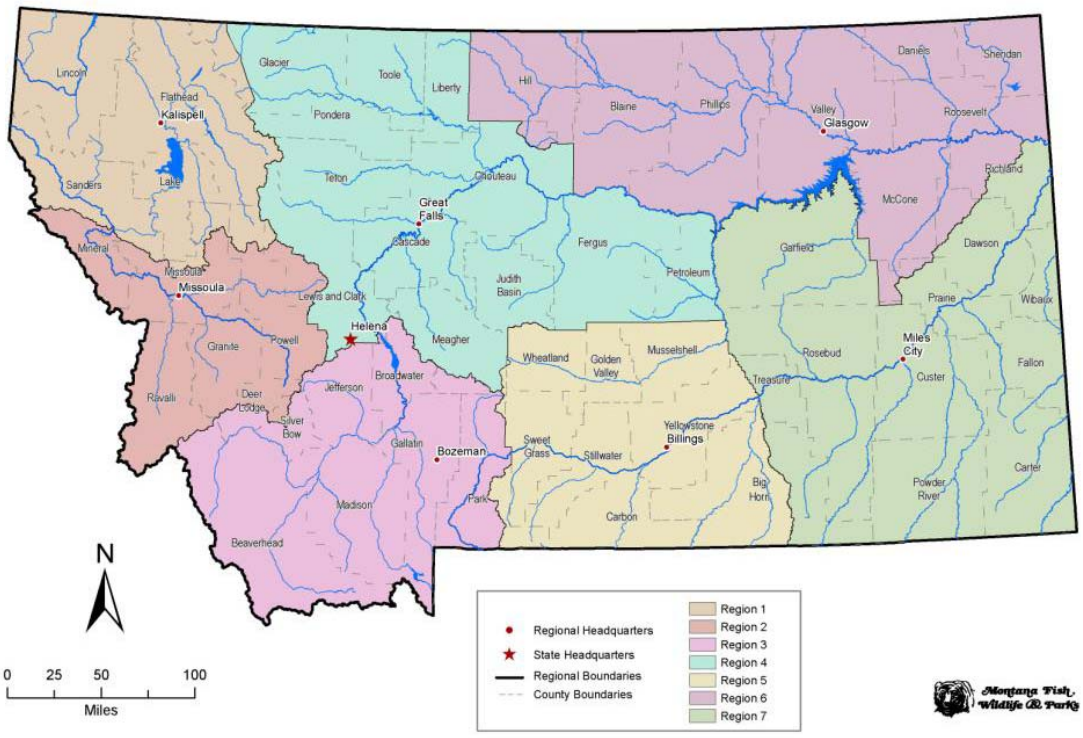

Figure 6. The seven regional areas of MFWP.

The explicit regions with schools participating in HOF are: Region 1, Region 3, Region 4, Region 5, Region 6, and Region 7. Region 2 was not included in this study for two primary reasons. The first reason was because the aquatic education program was not organized and implemented under the same HOF program model as the rest of the state. The second reason was the instructor was not available to work with the group as a primary stakeholder in the collaborative evaluation process.

This study was conducted in 80 total schools, which included 70 schools, and 132 classrooms participating in the HOF conservation education program during 2005-06 school year, and 10 schools and 14 classrooms not participating in the HOF program. Table 3 lists the number of HOF schools and classrooms in Montana during the 2005-06 school year, which includes one high school and one classroom that were not included in the study.

Table 3. MFWP regional and county locations of active HOF schools in 2005-06.

MFWP Region	County	# of HOF Schools	# of HOF Classrooms
1	Flathead	27	51
1	Lake	8	20
1	Lincoln	5	7
1	Sanders	3	7
3	Lewis & Clark	4	7
4	Cascade	6	11
4	Chouteau	2	4
4	Judith Basin	1	1
4	Meagher	1	1
4	Teton	5	9
4	Pondera	1	1
5	Yellowstone	6	8
6	Hill	1	5
7	Powder River	1	1
Total		71	133

Figure 7 displays the 14 counties these schools are located in of the 56 counties in the State, and identifies which of the seven MFWP regions the schools reside.

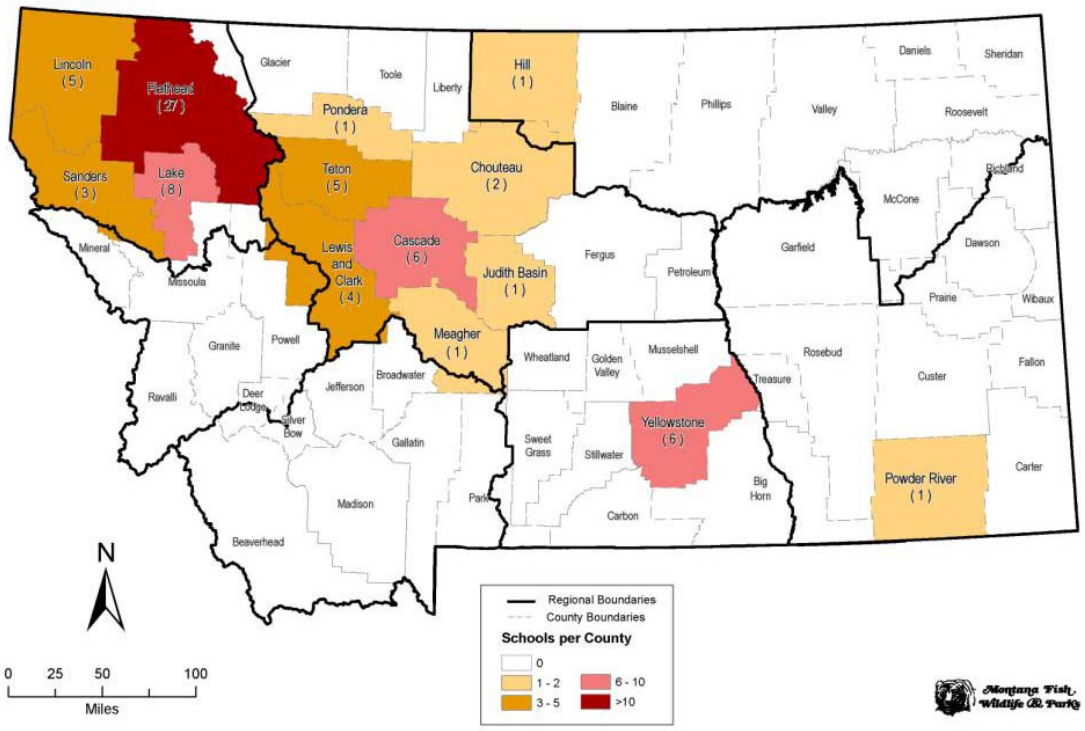

Figure 7. The geographic locations of 14 state counties with active HOF schools in 2005-06.

School Characteristics

Approximately 114 classroom teachers (86 female and 28 male), and their students, participated in the HOF program during the 2005-06 school year. Primarily, the HOF program activities are conducted at the individual schools in classroom environments. At least once a year, each teacher attempts to plan an outdoor fishing trip with chaperoning parents, other school personnel, and at least one HOF instructor if prearranged. When I visited the various schools to administer the surveys, I was struck by the diversity of the local landscapes, communities, school buildings, teachers, and learning environments.

A digital picture was taken of each school. The purpose was to catalog the diverse array of schools participating in the HOF program and in my study. The photos in Figures 8 and 9 show a sample of some urban and rural schools.

Figure 8. The larger HOF schools primarily in urban Montana communities.

Figure 9. The smaller HOF schools in rural Montana communities.

All schools and the collective communities of students, teachers, administrators, and support staff were quite different, yet surprisingly analogous in the way the various educational systems were structured.

Each visit to a school took approximately 30 minutes from the time of arrival to the time of departure. It took some 20 minutes to administer the survey, dependent on the grade level and whether the survey was read with the students or not. The time spent in each school was enough for me to get a snapshot impression of the characteristics of the school, the classroom, and the relationship between the teacher and the students.

It was interesting to note the students' response when the teacher announced that she needed their attention because they were going to be doing a survey related to the HOF program and why the study was being conducted. This was enough time for me to make an initial appraisal of the students' overall reaction to the program.

The classroom climate demonstrated excitement in most cases. When the students learned the study was being done to learn more about the HOF program and about their past experiences with fishing and the outdoors some wanted to begin telling a personal story. Once the survey was handed out to each student and started, it was fascinating to note that certain questions triggered some students to want, again, to tell a story, or give a commentary about how much they liked to dissect fish, or that they were "a catch and release guy" and therefore didn't clean or "gut" fish.

The various desk arrangements in each classroom seemed to have an affect on the way the students shared answers and in some cases worked together to complete their surveys. The desk arrangements ranged from single desks in several rows, pairs of desks in rows, clusters of four desks facing each other, two long rows of desks side by side - each desk directly touching a facing desk, and in a U-shape with some desks in the middle region. The classrooms with the desks either clumped or in direct contact with one another and student response portrayed a notably collegial environment - one in which the students seemed to enjoy learning, and respect and like their teacher.

Because the survey was conducted multiple times with the same students the opportunity was available to view the diverse fish art projects, bulletin boards with photos from fishing trips, realistically colored fish with identification tags hanging from the classroom ceiling, and journal entries describing their outdoor experiences. These projects added a valuable background perspective to the evaluation process that could not be gained through the paper and pencil surveys alone.

CHAPTER 4: METHODS

Research Design

A quasi-experimental[16] mixed methods[17] pre-test - post-test nonequivalent comparison group design (Creswell, 2003; Creswell and Clark Plano, 2007; Patton, 2002; Shadish, Cook, and Campbell, 2002; Weiss, 1998) was used. Pre-test (pre-survey), post-test (post-survey), and extended post-test (extended post-survey) were administered to the treatment group, and post-test (post-survey) and extended post-test (extended post-survey) were given to the comparison group. Because each classroom teacher made their own decision to participate in HOF, or the program was already established in their school, the ability to randomly assign students or classrooms of students to the HOF treatment group was not possible. Therefore, the quasi-experimental approach was required.

The units of analysis for the non-equivalent comparison groups were: (1) the "experimental" or treatment group made up of 2277 students in grades 3 - 10 in 70 schools participating in HOF; and (2) the “control” or comparison group made up 229 students in grades 4 - 5 in 12 schools not participating in HOF. The comparison group was purposefully selected (Patton, 2002) from schools that had not participated in the HOF program, but had the same relative school size, community type, and geographic distribution of the HOF schools. Purposeful

[16] Quasi-experimental studies are defined as nonrandomized, and not controlling for all confounding variables. Therefore, whatever variables and explanations are not controlled for must be taken into consideration when interpreting the data.
[17] Collecting and analyzing both quantitative and qualitative forms of data in a single study (Creswell, 2003, p. 15).

sampling was chosen because cases needed to be strategically selected for school size, grade level, and geographically distributed around the state of Montana.

The primary purpose of this summative evaluation study was to assess the effectiveness of the HOF program by examining how student outcomes - knowledge, attitudes, skills, and intended behaviors - changed over the course of the 2005 - 06 school year between youth who had participated in a HOF program and those who had not. The correlated paired sample results were then compared to determine levels of statistical significance and the direction of change for the outcomes from the pre-test to post-test and post-test to extended post-test outcomes. The study also sought to answer these research questions: (1) to determine if there was a significant association between student outcomes and the frequency of outdoor experiences (none – many) they had with HOF; and (2) if increased student knowledge significantly affected associated skills, attitudes, and intended behaviors.

It is important to note that one of the requirements of HOF was for the teachers to schedule at least one field experience during the school year. Some HOF teachers do not follow this requirement. Circumstances vary across years - the weather conditions might limit whether or not a teacher who has scheduled a field experience, for example ice fishing, was actually able to get the students outdoors or not.

The second purpose was to conduct a comprehensive, but systematic, program evaluation of HOF by assessing the outcomes - knowledge, attitudes,

skills, and intended behaviors - for all 3rd – 8th grade students. The classroom teachers participated in an Internet survey, and the volunteer HOF instructors were interviewed to provide qualitative evidence to gain deeper understanding of the program and comprehend the quality of program effectiveness. Content analysis methodology (Patton, 2002a) was used to analyze the information gathered from the open-ended questions answered by the classroom teachers and instructors. The purpose was to enhance the information gathered from the students' self-reported quantitative survey results. The data collected was considered and analyzed using both descriptive and inferential statistics.

The effectiveness of HOF was determined by measuring student responses to survey questions using a nonrandomized pre-test post-test design (Leedy and Ormrod, 2001).The prospect was that the evaluative process, assessment tools, and results may be generalized to be used by other conservation education program coordinators to replicate the approach and process to determine the effectiveness of their own programs. The dual purposes of this study were simultaneously achieved.

This study was supported by the MFWP Conservation Education Division, the Boone and Crockett Club, the Welder Wildlife Foundation, the National Fish and Wildlife Foundation, and the National Science Foundation's Center for Learning and Teaching in the West.

Description of Study Population

All, students, teachers, and instructors, in 70 schools throughout the State with a HOF program were included in this study during the 2005-06 school year. Therefore, a census of the entire population was conducted.

Experimental Group

The HOF population included three subgroups: 2277 students, 114 teachers, and 16 instructors. Students and teachers were all in mainstream public and private schools and were not members of any physically, psychologically, or socially vulnerable populations. The instructors were all either full-time or contract employees of MFWP. All students participating in HOF took part in the pre- and post-survey as a mandatory component of the program for the 2005-06 academic year. Written consent from parents/guardians was deemed not necessary by the Institutional Review Board because teachers had adopted HOF under the supervision of their school's administrator. Table 4 specifies the MFWP regions and the number of schools, teachers, classrooms, and students that were included in the experimental group.

Table 4. Numbers of HOF schools, teachers, classrooms, and students in 2005-06.

MFWP Region	Number of HOF Schools	Number of HOF Teachers	Number of HOF Classrooms	Number of HOF Students
1	43	75	85	1524
3	4	6	7	105
4	15	19	26	330
5	6	8	8	176
6	1	5	5	116
7	1	1	1	26
Total	70	114	132	2277

Student subgroup

Initially, selecting a random sample from the HOF student population through out the state of Montana was considered. However, it was decided by the MFWP aquatic education coordinator to expend the resources to acquire data from the entire population.

All 3rd - 10th grade students participating in the HOF program during the 2005-06 school year were involved. Of 2277 students, some 2083 students participated in the both pre- and post-surveys while 194 students participated in all three (pre-, post-, and extended post-) surveys.

Teacher subgroup

The 114 participating HOF teachers taught in 70 different public and

private schools around the state of Montana. These teachers were primarily elementary and middle school teachers and are described in Figure 10.

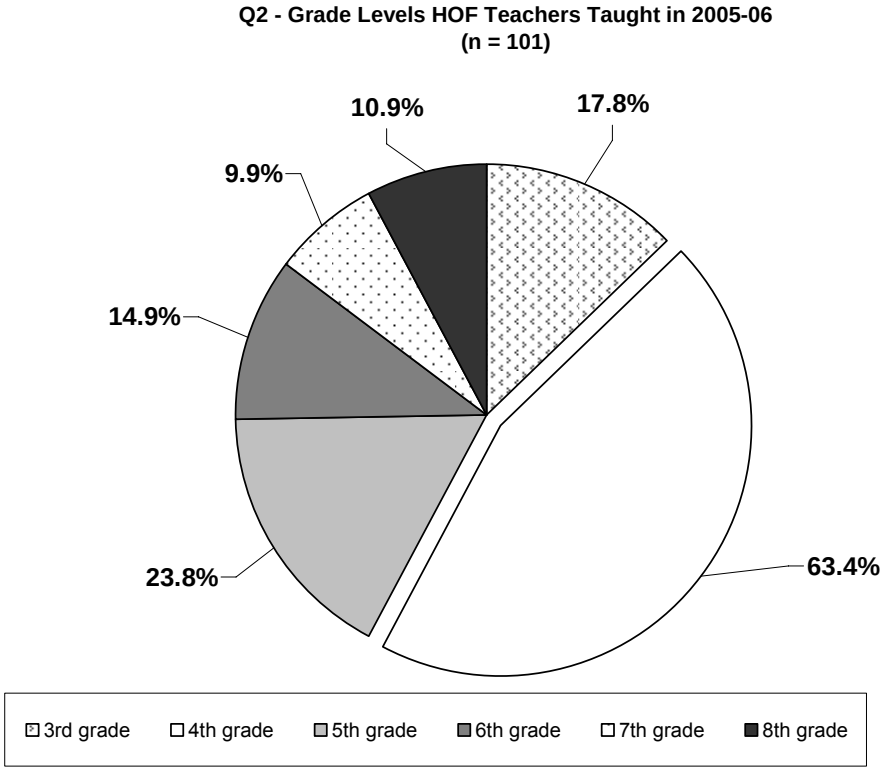

Figure 10. The grades HOF teachers taught in 2005-06.

Note:
The percentage of teachers came to more than 100% because some teachers taught more than one grade level.

Instructor subgroup

The 16 instructors conducted HOF programs across Montana. Some were assigned to specific schools, classrooms of students, and regions, while others traveled to many schools conducting the same activity(s) with different teachers and students. Table 5 delineates instructor categories, number of individuals, specific region(s) assigned to, and gender.

Table 5. Description of HOF instructors in Montana 2005-06.

Instructor Category	N	MFWP Region(s) Conduct HOF
MFWP Aquatic Education Coordinator	1	All Regions 1 - 7
MFWP Information & Education Specialist	6	Assigned Regions 1, 2, 4, 5, 6, 7
MFWP Contract HOF Instructor	5	Region 1
MFWP Contract HOF Instructor	4	Regions 3, 4, 5, 6, 7
Male	12	
Female	4	

Figure 11 indicates the number of years instructors had participated in the program since established in 1995-96.

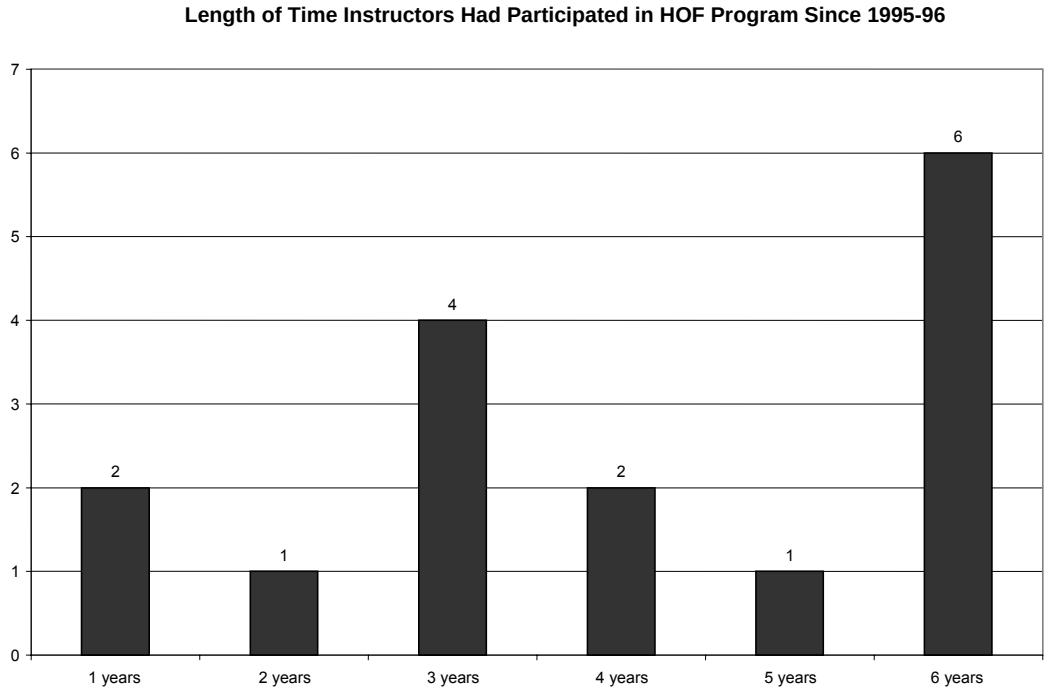

Figure 11. Length of time instructors participated in HOF program since 1995-96.

Control Group

The control or "comparison" group consisted of 229 students who had not participated in HOF. Fifty-five of the 229 students participated in the pre- and post- surveys, and 174 took part in the post- and extended post-surveys. All students in this group were in either 4th or 5th grade. Table 6 specifies the MFWP region, and number of schools, teachers, and students. This group was selected for comparative purposes and was substantiated as a purposeful sample. The schools were chosen from Regions 2, 3, 4, and 5. They had common characteristics to experimental schools and willing teachers who committed time to participate in my study. The 14 consenting classroom teachers assisted in the process to request and obtain parental/guardian permission for student's participation. This comparison group included students in 10 mainstream public schools, and none were members of any physically, psychologically, or socially vulnerable populations.

Table 6. The numbers of non HOF schools, teachers, classrooms, and students in 2005-06.

MFWP Region	Number of Non HOF Schools	Number of Non HOF Teachers	Number of Non HOF Classrooms	Number of Non HOF Students
2	2	3	3	37
3	3	6	6	124
4	4	4	4	57
5	1	1	1	11
Total	10	14	14	229

Treatment

In Montana, the HOFNOD program developed by the Future Fisherman Foundation was used as a framework to design the statewide HOF program coordinated by the Conservation Education Division's Aquatic Education Coordinator with MFWP in Helena, Montana.

The HOFNOD program focuses on preventing drug use through sport fishing and aquatic resources education, and is constructed on the premise that most youth do not use drugs, and that positive alternatives like fishing can distract children from drug use (Glick et al., 2002). Program activities are divided into four sections (Table 7) and are in most cases, taught in physical education classes.

Table 7. HOFNOD program sections and associated activities.

Sections	Activities
Angling Skills	basic equipment, knot tying, casting, and safety.
Fish Biology	anatomy, identification, behavior, water ecology, and habitat.
Human Dimensions	human impact on the environment, fishing regulations, ethics, conservation, management of resources, and stewardship of the environment.
Life Skills Development	decision making, peer and community relationships, problem solving techniques, setting goals, strengthening parental relationship, and making the commitment to remain drug free.

The MFWP offered classroom teachers the opportunity to integrate HOF in all content areas instead of just physical education. Between 1995-96 and 2004-05, HOF was adopted by approximately 200 teachers in 32 communities[18]. By 2005-06, HOF had been adopted by 114 teachers in 132 classrooms and 39 communities. The program was conducted mostly in elementary science classes, and was introduced to new teachers during annual fall workshops. The workshop also served to allow the instructors to share new HOF activities, develop schedules for the upcoming school year, and to present and discuss current issues.

Prior to this evaluation, the HOF program had no formal statement of goals and objectives. Once this was made apparent, the program coordinator formally documented the programs' goals and objectives. The goals were: (1) to introduce students, teachers, and parents to the fish and aquatic resources of Montana; and (2) to promote fishing and outdoor recreation as a positive activity. The objectives were: (1) to help students develop an awareness and appreciation for the fish and aquatic resources in Montana; (2) to help students develop an interest in fishing and outdoor recreation; (3) to teach safe and responsible outdoor skills; and (4) to help teachers develop skills and an interest in teaching fisheries and natural resource topics.

HOF consisted of four core classroom activities: (1) fish dissection; (2) aquatic insect identification; (3) tackle-knots-casting-water safety; (4) fish

[18] 200 teachers in 32 communities was a "ballpark" number established by MFWP for reporting purposes prior to 2005-06. These numbers included HOF programs conducted outside of schools as well as those in schools, for example a HOF program for a particular Scout or 4H group. The 2005-06 numbers represent only teachers in formal classrooms (D. Hagengruber, Personal communication, April, 2007).

identification/fishing regulations/fishing ethics. The program guidelines prescribed at least one outdoor field trip per classroom per year. The outdoor experiences usually included, but were not limited to open water and/or ice fishing, with the purpose to introduce students, teachers, and parents to the fish and aquatic resources of Montana, and promote fishing and outdoor recreation. These activities were considered by the program coordinator and educators to have positive influences on students. This was based on personal experience and anecdotal evidence.

Once the elements of the HOF protocol had been explored in detail a program logic model was constructed to illustrate the relationships between and among the program inputs, outputs, and outcomes. The logic model in Figure 12 provided a visual representation of the HOF program for the stakeholders and primary intended users.

Figure 12.
Logic model for Montana HOF program 2005-06.

Inputs	**Outputs**		**Outcomes**		
Investments	Activities	Participation	Short-term (Learning)	Mid-term (Action)	Long-term (Comprehensive Achievements)
MFWP Staff & Instructors Teachers Community Partners Equipment & Supplies Time Money	Conduct HOF Activities in & out of classroom Deliver materials to instructors Train instructors & teachers Partner with teachers & schools Facilitate the statewide program Assess & Report program numbers	Program participants - teachers, students, parents, administrators HOF Instructors Other MFWP Personnel Community Volunteers Program Sponsors	▪ Awareness & Appreciation ▪ Knowledge ▪ Attitudes ▪ Skills	▪ Skills ▪ Behavior	▪ Social ▪ Economic ▪ Civic ▪ Conservation

Utilization-focused Evaluation Process

The purpose of the program evaluation was to determine if the frequency of HOF field experiences had significant effect on participating student outcomes relative to becoming responsible users of natural resources and participation in stewardship of those resources. Patton's (1997) utilization-focused evaluation approach was used to accomplish that end.

The purpose of this approach was concentration on how the results of the evaluation were to be used by the intended users (Patton, 1997). The evaluation process involved systematic collection of information from HOF participants - students, teachers, and volunteer instructors relative to program activities, characteristics, and outcomes. A systematic evaluation design involved key individuals (stakeholders) in development and implementation of the program evaluation - from beginning to end. The stakeholders involved included the program coordinator, significant program instructors, and classroom teachers.

Utilization-focused evaluation (Patton, 1997) was initially considered to be a logical and, ostensibly, a stepwise linear process. But it was found that reflection, and "feedback loops" - to alter steps taken - were necessary to allow for required flexibility and creativity in the evaluative process. During the first step, the primary intended users of the evaluation discussed the HOF program and determined how to work with me as the evaluator, and share in the decision making process. Together we developed assessment instruments, determined how the participants were to be engaged in the process, and the evaluation implementation schedule (Patton, 2002b). Second, we committed to the uses of

the evaluation to determine foci for the project activities, outputs, and intended outcomes of the process. Table 8 (pp. 71 and 72) demonstrates the logical framework developed during the initial stages of the evaluation process.

Table 8.
Logic framework for the HOF program evaluation plan.

Activities[1]	Project Outputs[2]	Post-Project Outcomes[3]
Develop evaluation focus and create evaluation design with the primary intended users of the HOF program.	▪ Improve the evaluation process by developing the project design and assessment tools with HOF primary intended users.	▪ Increase the application and utility of HOF evaluation findings and implementation of recommendations
Pilot pre- survey and implement pre-, post and extended post surveys with HOF students in individual classrooms.	▪ Increased student knowledge and appreciation for fish and aquatic resources. ▪ Increased student interest and skills in fishing and outdoor recreation, and ethics. ▪ Increased understanding of safe and responsible outdoor skills related to fishing and aquatic habitats.	▪ Improve student engagement and motivation to learn about fish and aquatic resources in Montana. ▪ Increase amount of time students spend involved in fishing and outdoor recreation. ▪ Increase students' level of responsible use of natural resources. ▪ Increase participation in natural resource stewardship.

Table 8 (continued).
Logic framework for the HOF evaluation plan.

Activities[1]	Project Outputs[2]	Post-Project Outcomes[3]
Pilot and implement Internet survey for all HOF classroom teachers.	▪ Increased understanding of why classroom teachers use the HOF program. ▪ Improved teachers' satisfaction with the components of the program.	▪ Increase teachers' satisfaction with HOF activities. ▪ Increase quality of annual teacher trainings. ▪ Increase teacher retention and recruitment.
Pilot and conduct open-ended structured interviews to understand how HOF instructors gauge program success.	▪ Increased understanding how instructors gauge program success. ▪ Increased understanding how instructors work with teachers to provide HOF activities for students.	▪ Improve programmatic success for instructor retention and recruitment. ▪ Improve instructional strategies for HOF activities.
Analyze and report evaluation findings and make recommendations for intended users of HOF program.	▪ Increased understanding of most effective teaching strategies and content for HOF program.	▪ Improve capacity for MFWP to continue to measuring long-term program effectiveness for students and teachers.

Note.
(1) Activity: Task that is conducted during the project that will achieve a project objective.
(2) Project Output: A result after an activity has been completed. An output should be evident by the end of the project.
(3) Post-Project Outcome: A medium to long-term result that occurs after the project ends.
(NFWF, 2005)

The evaluation plan and measurement instruments examined the elements of HOF against explicit outcomes outlined in the logic model (Figure 12,

p. 69). The model provided a systematic and defined evaluation process to follow (Weiss, 1998).

The primary intended users followed my leadership when it came to making final measurement and design decisions. Throughout the process, working group members and outside evaluation experts from the Center for Learning and Teaching in the West[19] (CLTW) were consulted about appropriate methodology, understandability, and accuracy.

Some stakeholders volunteered to assist with the collection of data from students during the administration of the pre-, post-, and extended post-surveys. Once survey data were collected, organized for analysis, and the basic analyses conducted, I made presentations to the stakeholders and primary users in three MFWP regions to reveal preliminary results. These presentations took place during the fall 2006 educational workshops for teachers and instructors. Time was provided for active participation, similar to the initial planning sessions to design evaluation instrument questions.

The final step was a complete analysis of available data and preparation of a report for program evaluation and research purposes (Patton, 2002b). The program coordinator decided to make the final report available to all users of the program, to any interested parent or school administrator, and to share results with other state fish and wildlife agencies.

[19] Center for Learning and Teaching in the West is a consortium of five partner universities (Univ.of Montana; Montana State; Portland State; Colorado State; Univ. of Northern Colorado) collaborating with tribal colleges and public school systems. The Center addresses challenges in understanding and improving student learning and achievement in science and mathematics from middle school through college.

The purpose of working with the intended users of the program was because an essential component of a utilization-focused process is to ensure the results of the evaluation are used to improve the program - not just to determine effectiveness. The evaluation will be used to make "ethical"[20] judgments about the HOF program, improve program effectiveness, and/or inform decisions about future programming.

Instruments and Implementation

Student Pre-, Post-, and Extended Post-Surveys

During the HOF workshops in the fall of 2005, the program coordinator and affiliated regional instructors explained the need for and the intended purpose of the evaluation project to the involved teachers. These professional development gatherings are conducted yearly to schedule program activities for the upcoming school year, to cover new program materials, and provide training for teachers new to the program.

A schedule was developed to organize my travel around the State to administer the survey to assure maximum efficiency and minimize impacts on teachers and students. It took approximately 30 minutes to conduct the survey with each teacher in the classroom.

Pre-post and extended post-surveys contained 46 questions to determine self-reported measurable outcomes focused on students angling skills, knowledge of fish, aquatic habitats, personal attitudes and behaviors about

[20] "Ethical" in this case is defined as conforming to the standards of conduct of the - program evaluation - profession (Agnes, 1999).

natural resource management and stewardship, and intended participation in outdoor fishing activities as a result of HOF.

Every survey question was reviewed by a select group of teachers who volunteered their expertise and suggested changes for the final version of questions. Once those teachers, the MFWP coordinator, and MFWP Responsive Management personnel had given final approval of the survey instrument, it was pilot tested by me in November 2005, with a representative group of 10 4th and 5th grade students from a rural HOF school.

Piloting was constructive. First, it allowed a test run of the delivery method and to observe where students struggled with vocabulary, sentence structure, and order of the questions. Second, the elementary school principal was able to review the survey structure and questions to evaluate the readability and appropriate reading grade level of the survey. The reading grade level had been considered in designing questions. But, it was not until the administrator noted that many students were not able to read at present grade level that the decision was made to read the survey questions to and with all students in grades 3rd - 5th. The Flesch-Kincaid grade level score (Microsoft Office, 2003) for the survey questions themselves was 2.5, and when the directions were included in the analysis the grade level rating increased to 4.6. The Flesch reading ease score was 80.9.

The reading grade level and readability scores are calculated when the software finishes checking the spelling and grammar in a specific document. The program can display information about the reading level of the document,

including readability scores. Each readability score bases its rating on the average number of syllables per word and words per sentence.

The Flesch-Kincaid grade level score rates text on a United States school grade level and is based on the following: a score of 8.0 means that an eighth grader can understand the document if the student is reading at grade level.

The formula for the Flesch-Kincaid grade level score is:

$$(.39 \times ASL) + (11.8 \times ASW) - 15.59$$

Where: ASL = average sentence length, which is the number of words divided by the number of sentences). ASW = average number of syllables per word, which is the number of syllables divided by the number of words.

The Flesch reading ease score (Microsoft Office, 2003) is based on the text and is rated on a 100-point scale; the higher the score, the easier it is to understand the document. Most standard documents, aim for a score of approximately 60 to 70. The formula for the Flesch reading ease score is:

$$206.835 - (1.015 \times ASL) - (84.6 \times ASW)$$

After making changes received during the review process, all student surveys, accompanying directions, and parental permission forms (Appendixes B - D) were delivered to and approved by the Institutional Review Board at the University of Montana.

The pre-survey (Appendix B) was administered to 2277 3rd - 10th grade HOF students in their 132 respective classrooms. These surveys were completed between December 20, 2005 and January 20, 2006.

The post-survey (Appendix C) was administered from April 20 through May 31, 2006 to both the experimental and control groups. The extended post-survey (Appendix D) was conducted approximately 14 weeks after the post-survey, in the first 3 weeks of September 2006.The questions on the HOF surveys were designed similarly to questions Fedler (2004, 2005) used to evaluate the HOFNOD program.

Three HOF activities were observed by the evaluator. The first observation was done in a rural school classroom. The activities were fish identification and estimation of fish populations. These activities were done with 35 students from two combined 5th grade classrooms and took about 90 minutes. The second observation was an outdoor fishing rod casting activity for the purpose of demonstrating to students how to cast a lure when fishing for bass. The students took turns practicing casting with a rubber lure on the end of the fishing line, and a target on the grass about 30 feet from the caster. This activity was conducted in the schoolyard with three similar stations. This setting allowed each 4th and 5th grade student the chance to practice the skill three to four times before the next class arrived.

Classroom Teacher Internet Survey

An on-line teacher survey (Appendix E) was designed and conducted using "Survey Monkey" - SurveyMonkey.com - an Internet survey service and tool for creating web surveys. The software enables the survey to be designed using different question types, collect responses, and analyze the results. A useful feature is that results can be viewed as they are collected. The raw data

can be downloaded to a personal computer for further analysis. The purpose was to determine how effectively HOF provided outdoor skills and content for teachers interested in using the outdoor environment with classroom activities to teach students about fish, natural resources, and local conservation issues.

The entire group of 114 HOF teachers was asked to participate in the on-line teacher survey consisting of 35 questions. By participating the teachers gave consent to use the results in this study. The survey was piloted with five teachers who represented 3rd – 8th grades. All personal and school identifiers were removed and results were reported in aggregate.

The survey was initiated via e-mail on May 1, 2006 with a deadline for responses no later than June 2, 2006. Teachers without email access were sent a paper survey in the postal mail. Beginning May 15th , all non-respondents received weekly e-mail or postal mail notifications until May 31, 2006 encouraging response as suggested by Salant and Dillman (1994). Thirteen teachers did not respond, and were placed in the non-response category. However, 101 teachers responded, so the 88.59% response rate made it possible to avoid non-response error (Salant and Dillman, 1994).

Program Instructor Structured Open-ended Interview

A structured open-ended interview guide (Appendix F) was used to help understand how HOF instructors gauged the success of HOF for students, classroom teachers and themselves. More importantly, the technique allowed a better understanding of students' self-reported pre-, post-, and extended post-survey answers to questions, and to compare the results with the HOF teacher

survey results. The interview questions were developed by a representative group of HOF instructors.

Each instructor was interviewed via telephone from June 1, 2006 through June 30, 2006. The interviews were voluntary and anonymous, with results reported in the aggregate. All personal and school identifiers were removed. The interviews were timed and took no more than 1 hour to compete, the same set of 23 open-ended questions were used for each interview. The questions were emailed or mailed out to each interviewee one week prior to the interview to allow for review and preparation by participants. The interviews were, with permission of the interviewees, audio taped for transcription and content analysis (Patton, 2002a) purposes. In addition, notes were taken during the interview. Audio tapes will be destroyed upon the completion of the dissertation process and the preparation of final report for MFWP.

Instrument Implementation Timeline

The implementation of the student surveys, teacher surveys, and instructor interview instruments was conducted between the November 2005 and September 2006. Table 9. outlines the timeline followed.

Table 9. Timeline for the administered HOF evaluation instruments.

Date Administered	November - December 2005	May 2006	June 2006	Summer 2006 (14 weeks)	September 2006
HOF Student Survey	X Pre-survey	X Post-survey			X Extended Post-survey
NONHOF Student Survey		X Post-survey			X Extended Post-survey
HOF Teacher Survey		X			
HOF Instructor Interviews			X		

Quantitative Methods

Cronbach's alpha (Norusis, 2003) was calculated to determine the internal consistency for selected items of the 46 item scale that measured student outcomes - attitude, intended behaviors, skills, and knowledge - as resultants of HOF. The purpose of the reliability analysis was to study the properties of the scale and the individual questions of each outcome and determine the strength of the correlation. Good scales have values larger than 0.8; acceptable scales range between 0.6 and 0.75. A positive covariance and alpha close to 1.0 indicates individual items are highly correlated (Norusis, 2003).

Initially, a statistician[21] at the University of Montana was consulted who believed that parametric tests would be appropriate. Based on this advice I made the following assumptions: (1) the data were normally distributed; (2) that variances should not change systematically; (3) the discrete data were of

[21] Professor Rudy Gideon, Mathematics Department

interval-scale; and (4) the data from different subjects were independent (Field, 2000). However, the data collected did not meet the assumption that it was discrete and of interval-scale. The demographic data were discrete and of nominal-scale, and inferential data were categorically discrete and of ordinal-scale. Therefore, further consultation led to the decision to use nonparametric statistical methods for data analysis.

The statistical software program Statistical Package for Social Sciences (SPSS), version 14.0 (SPSS Inc., 2005) was used to conduct descriptive and inferential statistical analyses. Frequency distributions and means were calculated. Variance was not calculated because the discrete data was categorical and of ordinal-scale.

Two nonparametric tests were used to analyze statistical significance for the student survey results, the Chi-square test of distribution (Gravetter and Wallnau, 2002), and the McNemar-Bowker test (Marascuilo and McSweeney, 1977). The purpose of the chi-square test of distribution was to determine whether the observed values, or frequencies for the cells in the cross tabulation, deviated significantly from the corresponding expected values for those cells (George and Mallery, 2007). The expected values are based on the assumption that the two groups' (experimental and control group) answers for a particular survey question were independent or not related to each other. Expected values are computed under the assumption that the two groups are the same with respect to answering the questions. A large p-value ($p > 0.05$) confirms this and a small p-value ($p \leq 0.05$) rejects this as being unlikely. A large p-value indicates

no change, no significance, and the null hypothesis is accepted, i.e., indicates HOF has no bearing on student outcomes. A small p-value indicates a specific level of significance, change in direction, either positive or negative, and the null hypothesis is rejected.

The McNemar-Bowker test is a correlated paired sample chi-square test, and measures change when the same people or objects are measured at two different times. The observed values for each pre-, post-, and extended post-survey question correspond to one individual case or student. Therefore, when pre- to post-survey results and post- to extended post-survey results are compared within groups, they are considered correlated paired samples, and are not statistically independent. The Bowker extension is added to McNemar's test for square P x P (rows x columns) contingency tables with more than two rows and columns. The experimental hypothesis (H_1) was that, over time, the probability of change for student outcomes would be in a positive direction, due to the effect of the HOF treatment. The null hypothesis (H_0) was there would be no treatment effect.

Another nonparametric statistic was used to explore the associations between ranked pre- and post-survey results while controlling for specific variables related to each research question. The Spearman correlation (Gravetter and Wallnau, 2002) is "designed to measure the relationship between variables measured on an ordinal scale" (p. 404).

The results of the Spearman correlation (For example see Appendix G) were reviewed by the consulting statistician[22] because the values indicating strengths of the relationships were insubstantial, and statistical significance levels for controlled variables were relatively identical. The decision was made to use the McNemar-Bowker test when "controlling for" the effect of the variables of interest for the research questions. The test results would indicate statistical significance, and direction of the relationship.

Qualitative Methods

The qualitative data gathered from the Internet teacher survey and the instructor interviews were subjected to cross case content analysis (Patton, 2002a). Cross case refers to comparison of the data from individuals, and content analysis refers to reduction of experiences and opinions, and identifying core consistencies and meanings (Patton, 2002a). The analysis commenced with reading answers to open-ended survey questions and verbatim transcriptions from each interview. The answers to common questions were grouped. The significant information was sifted from insignificant to identify noteworthy patterns and emergent themes. The themes and descriptive findings were used to construct a framework to communicate what the data revealed.

Each theme was given a numerical code; then individual responses were assigned the corresponding code. On occasion a response had more than one theme, and was coded accordingly. The frequencies of coded responses were entered into Microsoft Office EXCEL 2003 to report frequencies and percentages, and to develop figures and charts to demonstrate results.

[22] Professor Rudy Gideon, University of Montana.

The collected data for content analysis (Patton, 2002a) was utilized to add depth and detail to the quantitative findings. Selected excerpts from interviews and survey responses were used as anecdotal evidence to more fully describe program effectiveness and consider the implications for program development.

Limitations & Delimitations

It is important to point out the limitations, or confounding variables in this, or any study. Variables such as teachers' and instructors' teaching experience, and the diversity of their life experiences, influenced how HOF was conducted in each school. The type of weather conditions experienced during 2005-06 influenced whether or not a class experienced ice fishing or not. Local access to fishing sites (Figure 13), and funding availability for school transportation to the sites influenced how often, and, if, HOF activities like spring, fall, or ice fishing, fish stocking, and aquatic insect identification were conducted. These limitations affected each student's experience and how they answered the survey questions. It was impractical to even try to control these variables.

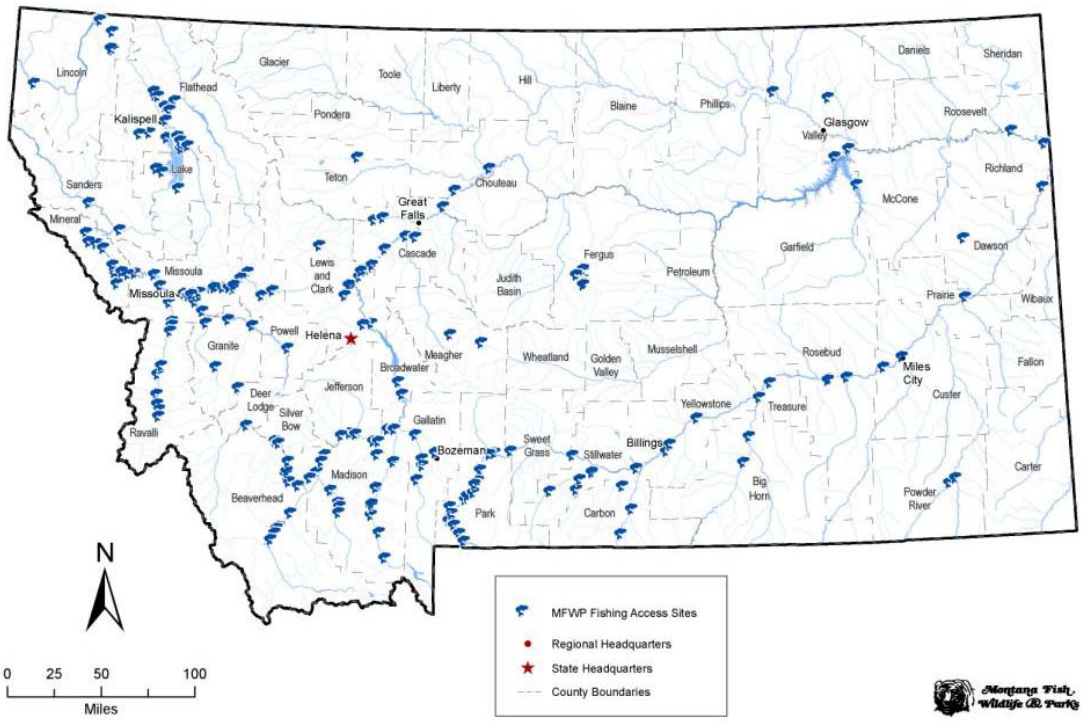

Figure 13. Montana Fish Wildlife & Parks fishing access sites 2007.

The delimitation, or deliberately imposed limitation was the time of year the pre-survey was administered. Throughout the State the program is started at different times in the fall or winter depending on when each teacher decides the program best fits into their curriculum. Due to the timing of project and study approval, instrument development, and the Institutional Review Board approval the pre-survey was not administered until late November, early December 2005. This was after many teachers (57.4%, n = 58) primarily in Region 1, had already conducted one of the required six HOF activities. Most teachers do more than six activities per year (D. Hagengruber personal communication, April, 2007). All surveys conducted during this time were considered pre-surveys in the statistical analyses, because there were no significant differences found in survey answers

given by students who had completed one activity and those who had done none. Ideally, the pre-survey would have been administered prior to any exposure of the treatment.

CHAPTER 5: RESULTS

This chapter includes data obtained from the quantitative and qualitative measures used in this study and is organized into five sections. The first section presents demographics of participants including the experimental and control student groups, the teachers, and the instructors. The second section presents the quantitative results for the student survey questions which measured student outcomes - attitude, intended behavior, skill, and knowledge. The statistical results are presented in the following order: (1) demonstrate whether HOF had a significant affect on the experimental group by comparing results to the control group; and (2) demonstrate how HOF affected experimental group outcomes, either positively, negatively, or no change. The third section presents the quantitative findings for the research questions. The first research question considered how the frequency of outdoor field experiences affected HOF student outcomes. The second question considered when student knowledge demonstrated a significant difference in a positive direction of change from pre- to post-surveys were students' skills, attitude and intended behavior affected positively also. The fourth section presents the quantitative and qualitative findings from the teacher Internet survey to demonstrate how the HOF program affected student outcomes. The fifth section presents the qualitative information from the structured open-ended instructor telephone interview to demonstrate how HOF was implemented and monitored to improve student outcomes.

Study Participant Demographics

This section describes the demographics for HOF students, students who had not participated in HOF, classroom teachers involved in HOF, and HOF instructors.

Students in The HOF Program

More male (51.3%, n = 1169) than female (48.7%, n = 1108) students participated in HOF in 2005-06. The students' ages, grade levels, and percentages by MFWP regions are displayed in Figure 14, Figure 15, and Figure 16 respectively.

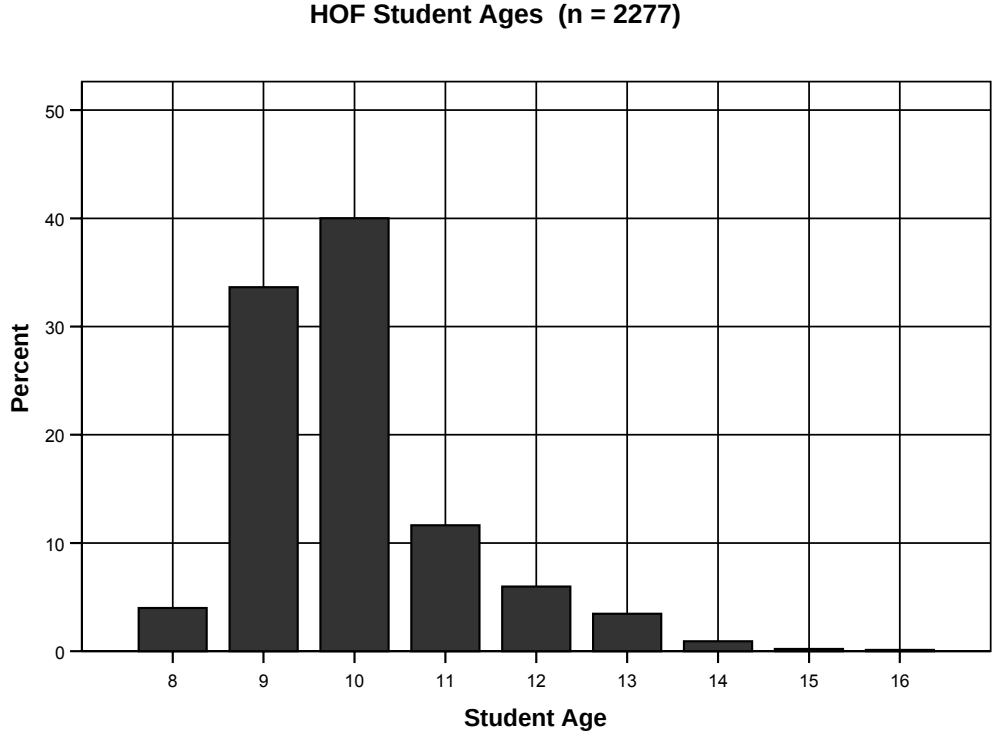

Figure 14. The ages of HOF students in 2005-06.

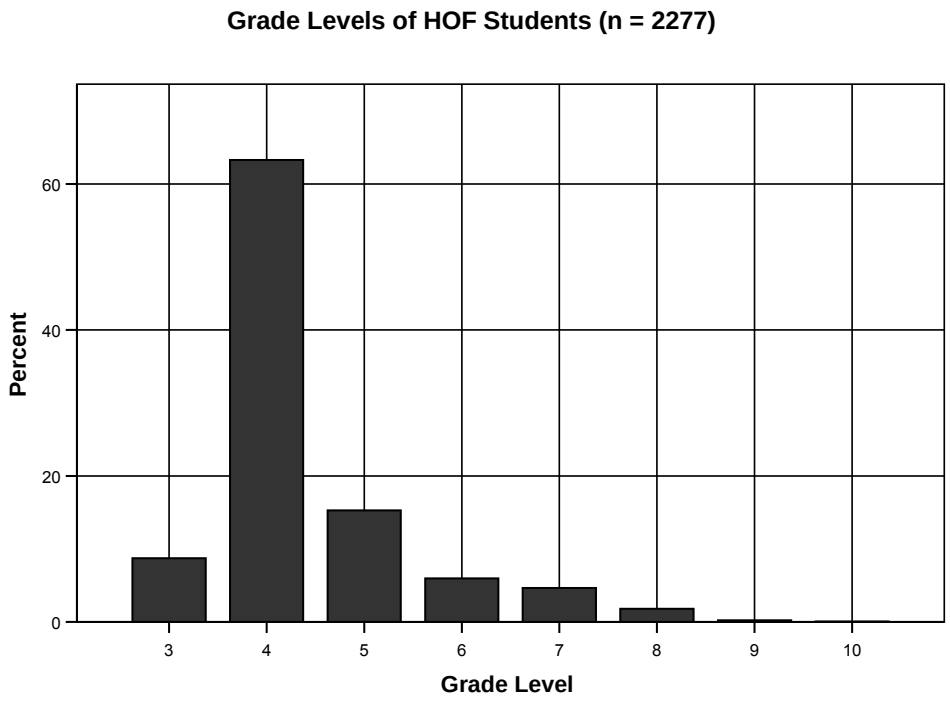

Figure 15. The grade levels of HOF students in 2005-06.

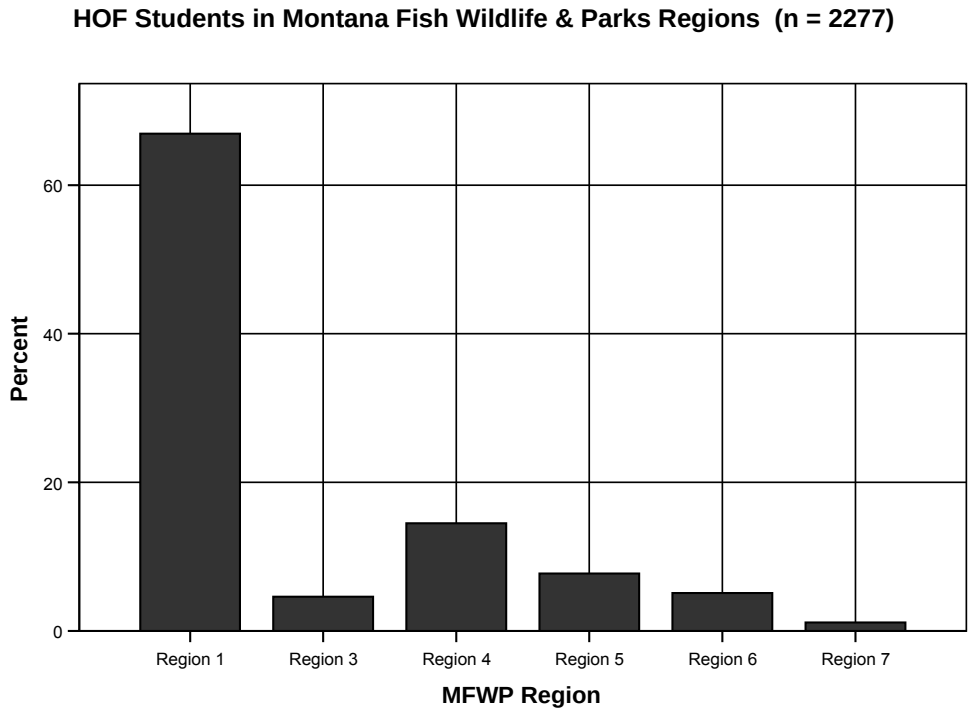

Figure 16. The percentages of HOF students in MFWP regions in 2005-06.

The students were primarily 9 - 10 years old, in the 4th grade, and mostly attended school in Region 1. They were asked if they had ever fished in their lifetime, 96% (n = 1965) said they had, and 40.2% (n = 916) had fished 6 or more times during the previous year. At the end of the school year students were asked if they would continue to fish in the future. The majority (78.8%, n = 1558) said "yes" and, 19.1% (n = 378) said "maybe".

The students were asked to name their favorite fish species found in Montana waters, and their favorite subject in school. Many students (31.5%) chose not to answer these questions. Some 23% (n = 523) of those that did answer selected rainbow trout. The favorite subject was Physical Education (PE) (26.6%, n = 605), followed by Math (24.7%, n = 562), only 12.7% did not answer this question. I assumed that those who did not answer, either didn't want to answer, had more than one answer (they were asked to give only one answer), or did not have a favorite.

The post-survey asked students to name their favorite HOF activity. Almost as many students (18.7%, n = 425) chose not to answer the question, as did those who selected fish dissection (21%, n = 479) and fishing (18.8%, n = 429).

Students Not in The HOF Program

More female (54.1%, n = 124) than male students (45.9%, n = 105) did not participate in HOF in 2005-06. Students' ages, grade levels, and percentages by MFWP regions are displayed in Figure 17, Figure 18, and Figure 19.

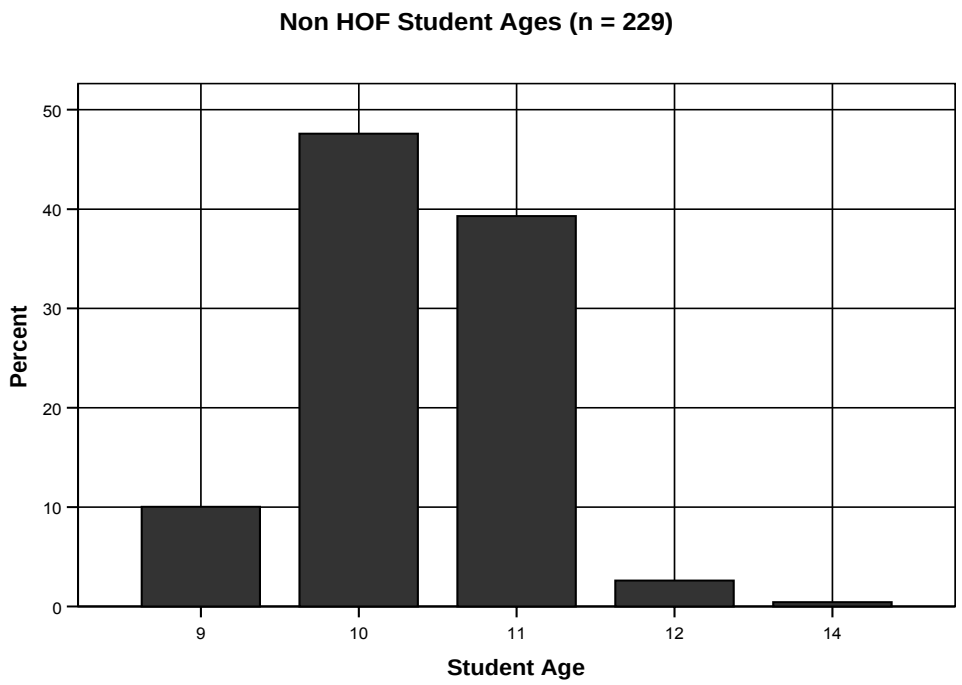

Figure 17. The ages of students not in HOF in 2005-06.

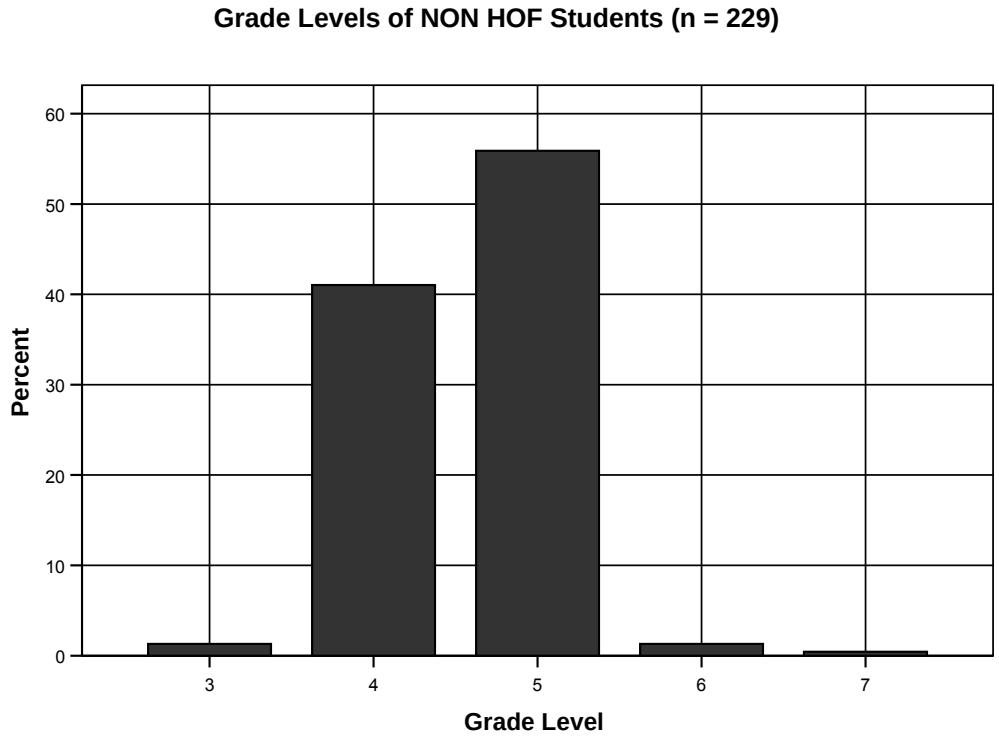

Figure 18. The grade levels of students not in HOF in 2005-06.

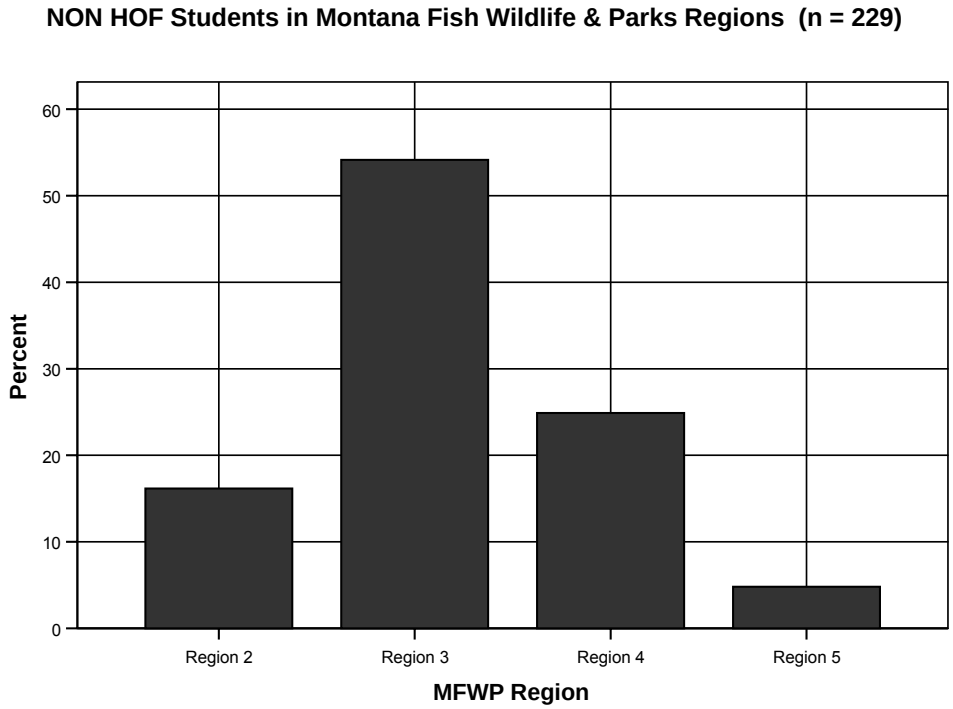

Figure 19. The percentages of students not in HOF in MFWP regions in 2005-06.

This group of students was mostly 10 and 11 years old, in the 4th and 5th grades, and attended school in Region 3. Ninety-three percent (n = 190) reported having fished, 36.4% (n = 79) had fished 6 or more times in the previous year, and 21% (n = 46) had fished 2 to 3 times. When asked if they would fish in the future, 78.2% (n = 169) said "yes", 18.5% (n = 40) said "maybe".

The students were asked to name their favorite fish found in Montana waters, and their favorite subject in school. As in the experimental group, many students (23.6%) chose not to answer this question, but of those that did 33.2% (n = 76) selected rainbow trout. Their favorite subject was Math (21.4%, n = 49) closely followed by Physical Education (PE) (17.9%, n = 41). Only 10% did not answer this question, the assumption was that those who did not answer, either

didn't want to answer, had more than one answer (they were asked to give only one answer), or did not have a favorite.

Teachers

There were 114 teachers involved in the HOF program in 2005-06. Those who responded (88.6%, n = 101) to the on-line survey taught grades 3 - 8. Their answers to questions provided information about the number of previous years they had taught (Figure 20), number of years they had been involved in HOF (Figure 21), why they decided to start HOF at their school (Figure 22), and the month of the 2005-06 school year they started the HOF program (Figure 23). Ninety-seven percent of the teachers who responded said they would highly recommend the program to other teachers.

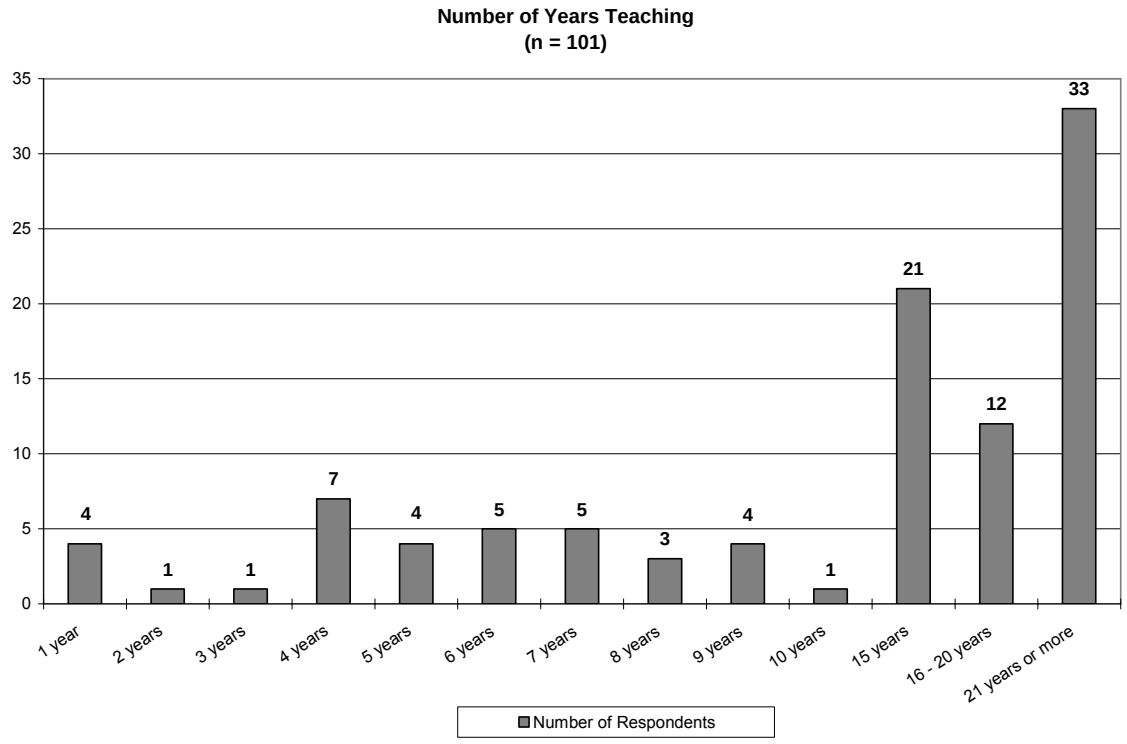

Figure 20. The number of years HOF teachers had been teaching in the classroom.

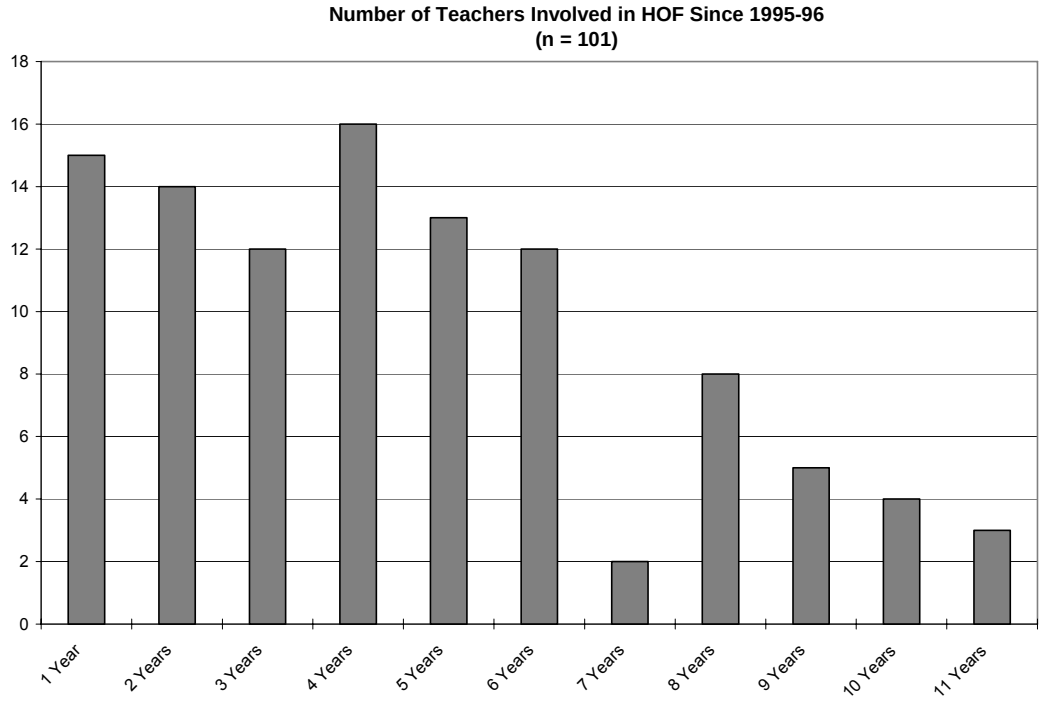

Figure 21. The number of years teachers had been participating in the HOF program.

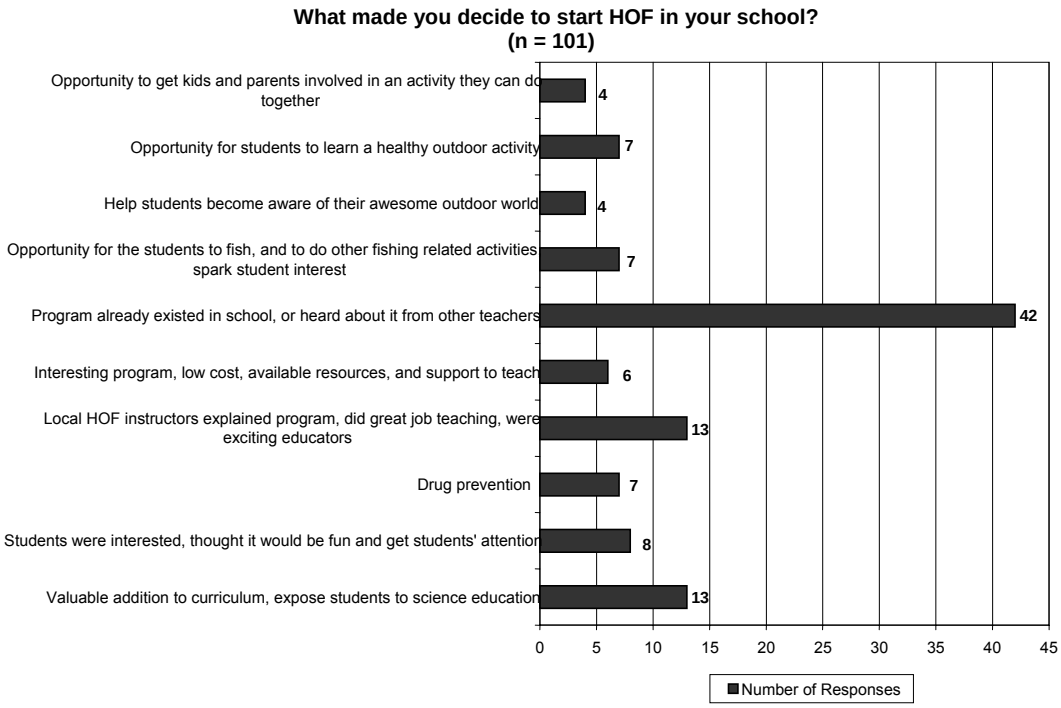

Figure 22. The reasons teachers decided to start HOF program in their school.

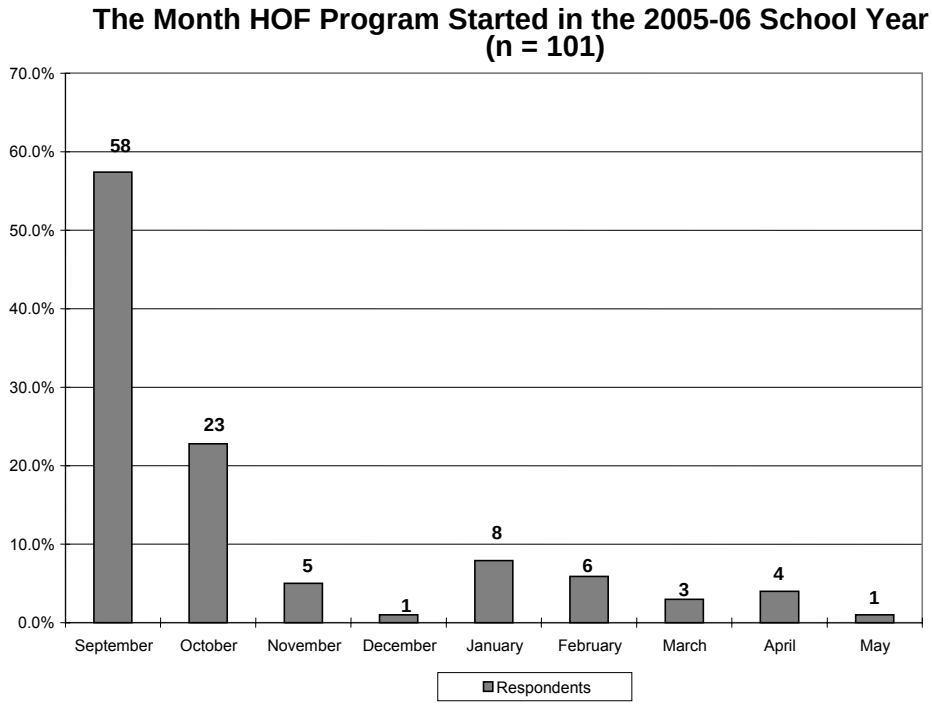

Figure 23.
The month of the school year teachers started the HOF program in 2005-06.

Thirty-three percent of the teachers had been teaching in the classroom for 21 years or more. Most teachers have been involved in HOF for 6 years or less, and 42% said that they were doing the program because it already existed in their school, or they had learned about it from another teacher. It has been assumed by me that most teachers had self-selected the program. Most teachers began the school year with one HOF activity, usually in September or October. The schedule of activities was determined by the teacher, the availability of the instructor(s), the season of the year, and weather conditions.

Instructors

Six HOF instructors, some 38% had been involved in the HOF program for 6 years or more, only 2 (13%) for 1 year, and the remaining 8 (50%) between 2 - 5 years but primarily for 3 (n = 4). When asked what factors most influenced them to become instructors, they said:

- Contact with students.
- Teach students how to fish and about the outdoors.
- Get involved with helping students gain self confidence through fishing.
- Great way to expose students to what MFWP does in a fun context.
- Interested in someway to stay involved in teaching.
- Love to teach.
- Part of present job.
- Fishing is personally important.
- Someone else suggested involvement.

Instructors in MFWP Regions 1 and 2 (n = 8) did at least four different HOF activities with assigned classrooms during the school year, while instructors in Regions 3 - 7 (n = 19) traveled the eastern two-thirds of the state, and did one or two specific activities in multiple classrooms during the school year. Table 10 lists the HOF activities conducted by the instructors.

Table 10. The different HOF activities conducted by 16 HOF instructors in 2005-06.

Activity	n[a]	%[b]
Fish ID	13	81
Fish Dissection	12	75
Casting	10	63
Spring Fishing	10	63
Lure Making	9	56
Fly Tying	8	50
Aquatic Insects	7	43
Knot Tying	7	43
Fishing Regulations & Ethics	6	38
Water Safety	6	38
Ice Fishing	6	38
Fall Fishing	6	38
Water Distribution	4	25
Fish Jeopardy	4	25
Fish Tackle	3	19
Native Fish	2	13
Habitat	2	13
Float Trips	2	13
Fish Anatomy & Behavior	2	13
Whirling Disease	2	13
Fish Art	2	13
Teacher Workshops	1	6
Invasive Species	1	6
All About Fish	1	6
Water Quality	1	6
Adopt Buffalo Head Pond	1	6
Missouri River Adopt-a-Fish	1	6
Prairie Streams	1	6
Stream Ecology	1	6
Fish Management	1	6
Bait Presentation	1	6
Live Fish ID	1	6
Kids Fishing Days	1	6

Note
[a] Number of instructors conducting specific activity during 2005-06.
[b] Percentage of all HOF instructors teaching the specific activity.

The total number of HOF programs conducted in 2005-06 by all instructors was 957. Most (63%, n = 604) were performed in classrooms and 37% (n = 353)

in the outdoors. The number of programs offered by individual instructors ranged from 14 to 160, in some cases more than one activity was done per day.

The instructors were asked what their past teaching experience was. Their answers fell into three distinct categories (Table 11). Some instructors had experience in more than one category.

Table 11. Types of past teaching experiences HOF instructors had before conducting HOF activities.

Teaching Experience	Number of Instructors	%
▪ K - 12 Formal Education	4	25
▪ K - 12 Nonformal Education	9	56
▪ College, Military, or Law Enforcement	7	44

Student Outcomes for Chi-square Test of Distribution

The assessment of youth's attitudes, intended behaviors, skills, and knowledge with respect to stewardship was based on collected self-reported data from youth who had participated in HOF (n = 2277), and a sample (n = 229) of otherwise comparable youth who had not. The same survey questions were asked of both groups.

From the original 46 survey questions (Appendix B), 32 were chosen (Appendix H) by me on the basis of how each question was associated with the student outcomes and addressed in the research questions. Both post-survey

and extended post-survey responses to selected questions were analyzed using the nonparametric chi-square test of distribution (Gravetter and Wallnau, 2002). The relational analyses were carried out in cross tabulation . My purpose was to determine if there was a significant difference between the responses given by experimental and control groups (Table 12). For example, question 10 asked the students, "How interested are you in learning more about Montana fish and the waters where they live?" The answer categories they chose an answer from were, "very interested", "sort of interested", "not very interested", and "do not care".

Table 12.
Chi-square test of distribution for post- and extended post-student surveys for experimental and control groups.

Outcome	Question	n [a]	n [b]	χ^2 [c]	*df*	*p-value* [d]
Attitudes	$Q8^{P}$- Think about fish	2012	226	5.908	4	0.206
	$Q8^{EP}$ - Think about fish	154	154	10.371	4	0.035*
	$Q9^{P}$ - Think about outdoor activities	2012	228	1.201	4	0.878
	$Q9^{EP}$ - Think about outdoor activities	155	153	5.257	3	0.154
	$Q10^{P}$ - Learn more about fish & water	2008	227	4.356	3	0.225
	$Q10^{EP}$ - Learn more about fish & water	155	154	16.802	3	0.001***
	$Q11^{P}$ - Learn science in the classroom	1992	225	16.571	4	0.002**
	$Q11^{EP}$ - Learn science in the classroom	155	154	9.274	4	0.055
	$Q12^{P}$ - Learn science in the classroom and the outdoors	2005	228	19.942	4	0.001***
	$Q12^{EP}$ - Learn science in the classroom and the outdoors	155	154	22.706	4	<0.001***
	$Q13^{P}$ - How do you care about fish	1999	225	3.872	2	0.144
	$Q13^{EP}$ - How do you care about fish	154	153	6.344	2	0.042*
	$Q14^{P}$ - How do you feel about fishing	2008	228	4.564	4	0.335
	$Q14^{EP}$ - How do you feel about fishing	155	154	10.279	4	0.036*

Table 12 (continued)
Chi-square test of distribution for post- and extended post-student surveys for experimental and control groups.

Outcome	Question	n [a]	n [b]	χ^2 [c]	*df*	*p-value* [d]
Intended Behaviors	Q15a^{P} - Visit and explore places such as creeks, ponds, lakes & wetlands	1998	227	0.326	2	0.850
	Q15a^{EP} - Visit and explore places such as creeks, ponds, lakes & wetlands	155	154	6.396	2	0.041*
	Q15b^{P} - Help take care of places in your area where plants, fish and wildlife live	2000	227	2.856	2	0.240
	Q15b^{EP} - Help take care of places in your area where plants, fish and wildlife live	155	154	2.19	2	0.334
	Q15c^{P} - How things you do might affect plants, fish, and wildlife that live in or near water	1997	227	13.663	2	0.001***
	Q15c^{EP} - How things you do might affect plants, fish, and wildlife that live in or near water	155	154	1.623	2	0.444
	Q15d^{P} - Use water carefully	1999	228	12.475	2	0.002**
	Q15d^{EP} - Use water carefully	155	154	2.933	2	0.231
	Q15e^{P} - Help make sure that people in the future have clean water to drink	2004	228	2.814	2	0.245
	Q15e^{EP} - Help make sure that people in the future have clean water to drink	155	154	1.221	2	0.543
	Q15f^{P} - Help make sure that people in the future have places to enjoy the outdoors	1996	228	0.731	2	0.694
	Q15f^{EP} - Help make sure that people in the future have places to enjoy the outdoors	154	154	3.728	2	0.155

Table 12 (continued).
Chi-square test of distribution for post- and extended post-student surveys for experimental and control groups.

Outcome	Question	n [a]	n [b]	χ^{2} [c]	*df*	*p-value* [d]
Skills	$Q24^{P}$ - Reading and knowing the fishing laws before fishing	2008	228	5.147	3	0.161
	$Q24^{EP}$ - Reading and knowing the fishing laws before fishing	155	154	4.658	3	0.199
	$Q25^{P}$ - Carefully, handling a fish you have caught	2003	227	5.344	3	0.148
	$Q25^{EP}$ - Carefully, handling a fish you have caught	155	153	5.904	3	0.166
	$Q26^{P}$ - Carefully, releasing a fish you catch	1998	227	8.219	3	0.042*
	$Q26^{EP}$ - Carefully, releasing a fish you catch	155	154	4.108	3	0.250
	$Q27^{P}$ - Carefully, cleaning (or gutting) the fish you catch	1994	227	39.077	3	<.001***
	$Q27^{EP}$ - Carefully, cleaning (or gutting) the fish you catch	155	154	25.819	3	<.001***
	$Q28^{P}$ - Correctly, identifying different kinds of fish	1993	227	6.42	3	0.093
	$Q28^{EP}$ - Correctly, identifying different kinds of fish	155	153	13.432	3	0.004**
	$Q29^{P}$ - Using different kinds of fishing equipment	1995	225	7.318	3	0.062
	$Q29^{EP}$ - Using different kinds of fishing equipment	155	152	11.489	3	0.009**
	$Q31^{P}$ - Casting your fishing line into the water	2001	228	12.891	3	0.005**
	$Q31^{EP}$ - Casting your fishing line into the water	155	154	8.232	3	0.041*
	$Q32^{P}$ - Tying good fishing knots in your fishing line	2000	227	36.612	3	<0.001***
	$Q32^{EP}$ - Tying good fishing knots in your fishing line	154	154	14.612	3	0.002**
	$Q33^{P}$ - Ice fishing	2001	227	109.35	3	<0.001***
	$Q33^{EP}$ - Ice fishing	155	154	34.315	3	<0.001***
	$Q34^{P}$ - Cleaning up the area where you fish	2000	228	14.018	3	0.003**
	$Q34^{EP}$ - Cleaning up the area where you fish	155	154	7.632	3	0.054*
	$Q35^{P}$ - Following the fishing laws when fishing	1999	226	11.185	3	0.011*
	$Q35^{EP}$ - Following the fishing laws when fishing	154	154	0.347	3	0.951

Table 12 (continued).
Chi-square test of distribution for post- and extended post-student surveys for experimental and control groups.

Outcome	Question	n [a]	n [b]	χ^2 [c]	*df*	*p-value* [d]
Knowledge	Q37^{P} - Montana fishing laws	1998	227	14.371	3	0.002**
	Q37^{EP} - Montana fishing laws	155	150	8.98	3	0.030*
	Q38^{P} - The different native and not (non) native fish in Montana	1987	226	14.121	3	0.003**
	Q38^{EP} - The different native and not (non) native fish in Montana	155	153	11.034	3	0.012*
	Q39^{P} - The different names of fish found in Montana waters	1990	226	12.405	3	0.006**
	Q39^{EP} - The different names of fish found in Montana waters	155	153	5.467	3	0.141
	Q40^{P} - The things that make good habitat for fish	1991	226	3.949	3	0.267
	Q40^{EP} - The things that make good habitat for fish	155	151	4.357	3	0.225
	Q41^{P} - The importance of clean water to people, plants, and animals	1986	225	0.678	3	0.878
	Q41^{EP} - The importance of clean water to people, plants, and animals	155	153	0.811	3	0.847
	Q44^{P} - The body parts of a fish, and what they do for the fish	1991	227	43.235	3	<.001***
	Q44^{EP} - The body parts of a fish, and what they do for the fish	154	153	12.756	3	0.005**
	Q45^{P} - The jobs that people have that work with fish and wildlife in Montana	1993	226	11.914	3	0.008**
	Q45^{EP} - The jobs that people have that work with fish and wildlife in Montana	155	153	8.944	3	0.030*
	Q46^{P} - The jobs that people have that work with science and the natural world	1987	226	8.989	3	0.029*
	Q46^{EP} - The jobs that people have that work with science and the natural world	154	153	3.342	3	0.342

Note.
[a] Number of experimental cases used in the analysis
[b] Number of control cases used in the analysis
[c] Pearson Chi-Square statistic
[d] Asymptotic significance (2-sided) based on Pearson Chi-Square statistic
[P] Post survey data
[EP] Extended post survey data
*$p \leq 0.05$. **$p \leq 0.01$. ***$p \leq 0.001$.

The Chi-square test of distribution (Table 12, pp. 101 - 104) was used to determine whether the observed values (or frequencies) deviated significantly from the corresponding expected values. The expected values were based on the assumption that the two groups (experimental and control groups) for a particular survey question were independent - i.e., not related. Expected values were computed under the assumption that the two students groups were the same with respect to their answers to questions.

A large p-value ($p > 0.05$) confirmed this assumption indicating no significant difference. A small p-value ($p \leq 0.05$) rejected the assumption, indicating a statistically significant difference. The overall question, whether the students in the two groups (experimental or control) responded similarly to the survey questions indicated if the HOF program had an effect or not. The hypotheses were:

H_0 : Experimental group responded the same as the control group.

H_1 : Experimental group did not respond the same as the control group. When the null hypothesis was accepted, chance alone was a likely explanation for the different response frequencies to the questions. Therefore, the frequency or count was independent or unrelated to the group that included the individual.

The results of post- and extended post-surveys were used to interpret whether HOF had significant affect on the following student outcomes:

Attitudes - The chi-square test of distribution for attitude questions (Table 12, p. 101) demonstrated whether or not the HOF program had an effect on the students who had participated in the program - the experimental group,

compared to non participants - the control group. The findings of the post-survey indicated that there was no significant difference between the two groups of students, with the exception for two questions. These questions were "how the students felt about learning science in the classroom only" ($p = 0.002$), and "how they felt about learn science in the classroom and in the outdoors" ($p = 0.001$). Why was this evident? Perhaps because HOF was integrated into science classes most often and conducted both in the classroom and outdoors.

The findings from the extended post-survey exhibited significant differences for 5 of the 7 attitude questions, this indicated that HOF had a significant effect over an extended time. The questions that showed statistically significant differences were "what students thought about fish" ($p = 0.035$), "whether they were interested in learning more about fish and water" ($p = 0.001$), "felt about learning science in the classroom and outdoors" ($p < 0.001$), "how they cared about fish" ($p = 0.042$), and "how they felt about fishing" ($p = 0.036$).

Intended Behaviors - The chi-square test of distribution relative to post-survey questions connected to intended behaviors (Table 12, p. 102) indicated that there was no significant difference between the two groups of students, except for responses to two questions. The questions focused on the importance of "how things they do might affect plants, fish, and wildlife that live in or near water" ($p = 0.001$), and "using water carefully" ($p = 0.002$).

The responses to the extended post-survey exhibited no significant differences for all intended behavior questions, except one - "to visit and explore places such as creeks, ponds, lakes, and wetlands" ($p = 0.041$). These results

indicated HOF had little, to, no significant effect over time on participating students relative to potentially changed behaviors. Intended behaviors did not significantly change as a result of HOF except for those intended behaviors that were directly related to HOF outdoor experiences.

Skills - The chi-square test of distribution for skill questions (Table 12, p. 103) demonstrated that the results of the post-survey indicated there were many differences between the two groups of students in terms of skills. There were only 4 questions of the 11 where analysis revealed no significant difference. They were skills related to reading and knowing the fishing laws, and carefully handling a caught fish. The questions which did indicate significant differences were: "how well students knew how to carefully release a fish" ($p = 0.042$); "carefully clean a fish" ($p < 0.001$); "cast fishing line into the water" ($p = 0.005$); "tie good fishing knots in fishing line" ($p < 0.001$); "ice fish" ($p < 0.001$), "clean up the area where they fish" ($p = 0.003$); and "follow fishing laws when fishing" ($p = 0.011$).

The extended post-survey results were mixed, 7 of the 11 skill questions continued to demonstrate a significant difference between groups. Skills that showed a significant difference were: "carefully cleaning a fish" ($p < .001$); "correctly identify different kinds of fish" ($p = 0.004$); "use different kinds of fishing equipment" ($p = 0.009$); "cast fishing line into the water" ($p = 0.041$); "tie good fishing knots in fishing line" ($p = 0.002$); "ice fish" ($p < 0.001$); and "clean up the area where they fish" ($p = 0.054$). The remaining 4 skill questions showed no significant difference, they were: "read and know fishing laws before fishing";

"carefully handle a fish"; carefully release a fish", and following fishing laws when fishing".

Knowledge - The chi-square test of distribution for knowledge questions (Table 12, p. 104) demonstrated that findings of the post-survey indicated there were many statistically significant differences between the two groups of students. Only two questions showed no significant difference they were: "things that make good habitat for fish"; and "the importance of clean water to people, plants, and animals". The six questions which displayed significant differences were, how much students thought they knew about: "Montana fishing laws" ($p = 0.002$), "different native and non-native fish" ($p = 0.003$), "different names of fish in Montana waters" ($p = 0.006$), "body parts of a fish, and what they do for the fish" ($p < 0.001$), "jobs people have that work with fish and wildlife in Montana" ($p = 0.008$), and "jobs people have that work with science and the natural world" ($p = 0.029$).

The extended post-survey results were mixed. Knowledge questions that continued to show significant differences were: "Montana fishing laws" ($p = 0.030$), "different native and non-native fish in Montana" ($p = 0.012$); "body parts of a fish, and what they do for the fish" ($p = 0.005$); and "jobs people have that work with fish and wildlife in Montana" ($p = 0.030$). Four questions that showed no significant difference were: "different names of fish found in Montana waters", "things that make good habitat for fish", "importance of clean water to people, plants, and animals", and "jobs that people have that work with science and the natural world".

The questions which showed significant differences for each outcome in the chi-square test of distribution (Table 12, pp. 101 - 104) were subsequently analyzed to determine their reliability scales (Table 13). The type of reliability analysis used was Cronbach's alpha (Norusis, 2003). This measure of reliability was used to measure internal consistency of the selected relevant questions for each student outcome. The closer alpha is to1.0, the greater the internal consistency of the survey questions (George and Mallery, 2007).

Table 13. Reliability analysis for selected survey questions focused on student outcomes.

Outcome	Question [a]	n [b]	n [c]	Cronbach's alpha
Attitudes	Q8 - Think about fish	1966	7	0.785
	Q9 - Think about outdoor activities			
	Q10 - Learn more about fish & water			
	Q11 - Learn science in the classroom			
	Q12 - Learn science in the classroom and the outdoors			
	Q13 - How do you care about fish			
	Q14 - How do you feel about fishing			
Behaviors	Q15a - Visit and explore places such as creeks, ponds, lakes & wetlands	1977	6	0.745
	Q15b - Help take care of places in your area where plants, fish and wildlife live			
	Q15c - How things you do might affect plants, fish, and wildlife that live in or near water			
	Q15d - Use water carefully			
	Q15e - Help make sure that people in the future have clean water to drink			
	Q15f - Help make sure that people in the future have places to enjoy the outdoors			
Skills	Q24 - Reading and knowing the fishing laws before fishing	1952	11	0.863
	Q25 - Carefully, handling a fish you have caught			
	Q26 - Carefully, releasing a fish you catch			
	Q27 - Carefully, cleaning (or gutting) the fish you catch			
	Q28 - Correctly, identifying different kinds of fish			
	Q29 - Using different kinds of fishing equipment			
	Q31 - Casting your fishing line into the water			
	Q32 - Tying good fishing knots in your fishing line			
	Q33 - Ice fishing			
	Q34 - Cleaning up the area where you fish			
	Q35 - Following the fishing laws when fishing			
Knowledge	Q37 - Montana fishing laws	1948	8	0.862
	Q38 - The different native and not (non) native fish in Montana			
	Q39 - The different names of fish found in Montana waters			
	Q40 - The things that make good habitat for fish			
	Q41 - The importance of clean water to people, plants, and animals			
	Q44 - The body parts of a fish, and what they do for the fish			
	Q45 - The jobs that people have that work with fish and wildlife in Montana			
	Q46 - The jobs that people have that work with science and the natural world			

Note.
[a] Questions selected as key attributes of Student Outcomes for the HOF treatment.
[b] Number of cases used in analysis
[c] Number of questions used in analysis to determine reliability coefficient.

All questions used in subsequent analyses had good scales of internal consistency for student outcomes. These groups of questions were then used in paired sample correlation analyses to determine whether the HOF program had significant effects on the outcomes for the experimental group only, in either positive or negative directions.

HOF Student Correlated Pair Samples

The McNemar-Bowker test (Marascuilo and McSweeney, 1977) assumes that the responses to questions were collected from correlated paired samples (pre-post surveys and post-extended post surveys) which were from the same individuals at two different times. The responses were counts from a multivariate distribution of categorical variables (See Appendix B, Pre-Survey categorical ordinal answer choices for each question, p. 191). The test determined whether the upper right hand corner of the contingency table (a square table larger than 2 x 2) was symmetrical with the lower left corner. See Appendix G (p. 255) for an example of a contingency table. The results indicated that among those observations where change was observed, the probability of change from time one to time two was identical to the probability of change from time two to time one.

For example, skill survey question number 25 (Appendix B, p. 197), asked students to consider how well they knew how to "carefully handle a fish they caught". Possible answers were, "very well", "pretty well", "not very well", and "don't know how at all". The null hypothesis was that students' fish handling skills at time one would equal their skills at time two, therefore, there was no change.

The alternative hypothesis was that the change would go in either a positive or negative direction. The intention of the treatment - the HOF program - was for the students' skill level to improve.

The McNemar-Bowker test (Marascuilo and McSweeney, 1977) was used to determine the level of significance, and which direction - positive, negative, or both - the paired sample frequencies changed for each outcome attribute from pre- to post-survey and from post-survey to extended post-survey only for students who had participated in HOF. The results are presented by groups of outcome questions beginning with attitudes (Table 14, pp. 112 - 113), and followed by intended behaviors (Table 15, pp.114 - 115), skills (Table 16, pp. 117 - 118), and knowledge (Table 17, pp. 120 - 121).

Table 14.
McNemar-Bowker test for attitude outcome for pre-post correlation paired sample results for experimental group.

Question	n	χ^2	*df*	*p-value*	Direction of change[b]
$Q8^{PP}$- Think about fish	1788	35.885	10	<0.001***	⇓
$Q9^{PP}$ - Think about outdoor activities	1789	5.566	10	0.850	ns
$Q10^{PP}$ - Learn more about fish & water	1778	62.340	6	<.001***	⇓
$Q11^{PP}$ - Learn science in the classroom	1747	15.267	10	0.123	ns
$Q12^{PP}$ - Learn science in the classroom and the outdoors	1776	7.258	10	0.701	ns
$Q13^{PP}$ - How do you care about fish	1770	3.264	3	0.353	ns
$Q14^{PP}$ - How do you feel about fishing	1785	15.442	10	0.117	ns

Table 14 (continued).
McNemar-Bowker test for attitude outcome for post- and extended post-correlated paired sample results for experimental group.

Question	n	χ^2	*df*	*p-value*	Direction of change[b]
Q8[PEP]- Think about fish	145	-	-	[a]	-
Q9[PEP] - Think about outdoor activities	146	2.476	4	0.649	ns
Q10[PEP] - Learn more about fish & water	146	6.937	5	0.225	ns
Q11[PEP] - Learn science in the classroom	146	-	-	[a]	-
Q12[PEP] - Learn science in the classroom and the outdoors	146	-	-	[a]	-
Q13[PEP] - How do you care about fish	145	-	-	[a]	-
Q14[PEP] - How do you feel about fishing	146	13.760	9	0.131	ns

Note.
[a] Asymptotic significance (2-sided) computed only for a P x P table, where P must be greater than 1.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
[PEP] Post- and Extended Post-survey data for Experimental group only
*$p \leq 0.05$. **$p \leq 0.01$. ***$p \leq 0.001$.

Table 15.
McNemar-Bowker test for intended behavior outcome for pre-post correlation paired sample results for experimental group.

Question	n	χ^2	*df*	*p-value*	Direction of change[b]
Q15a[PP] - Visit and explore places such as creeks, ponds, lakes & wetlands	1773	4.330	3	0.228	ns
Q15b[PP] - Help take care of places in your area where plants, fish and wildlife live	1774	10.207	3	0.017*	⇓
Q15c[PP] - How things you do might affect plants, fish, and wildlife that live in or near water	1768	57.940	3	<0.001***	⇓
Q15d[PP] - Use water carefully	1771	2.160	3	0.540	ns
Q15e[PP] - Help make sure that people in the future have clean water to drink	1777	12.852	3	0.005**	⇓
Q15f[PP] - Help make sure that people in the future have places to enjoy the outdoors	1768	9.241	3	0.026*	⇓

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
**p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.*

Table 15 (continued).
McNemar-Bowker test for intended behavior outcome for post- and extended post- correlated paired sample results for experimental group.

Question	n	χ^2	*df*	*p-value*	Direction of change[b]
Q15a[PEP] - Visit and explore places such as creeks, ponds, lakes & wetlands	146	-	-	[a]	-
Q15b[PEP] - Help take care of places in your area where plants, fish and wildlife live	144	1.467	3	0.690	ns
Q15c[PEP] - How things you do might affect plants, fish, and wildlife that live in or near water	144	3.333	3	0.343	ns
Q15d[PEP] - Use water carefully	145	0.458	2	0.795	ns
Q15e[PEP] - Help make sure that people in the future have clean water to drink	145	2.043	3	0.563	ns
Q15f[PEP] - Help make sure that people in the future have places to enjoy the outdoors	144	-	-	[a]	-

Note.
[a] Asymptotic significance (2-sided) computed only for a PxP table, where P must be greater than 1.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PEP] Post- and Extended Post-survey data for Experimental group only
*$p \leq 0.05$. **$p \leq 0.01$. ***$p \leq 0.001$.

The results for attitude and intended behavior questions were significant, because, for all pre- and post-survey questions which showed statistical significance, the direction of change was negative. The results for post- to extended post-surveys all showed no significant difference, and therefore had no change in direction.

This observation is more fully revealed when the actual counts, or frequencies in the contingency tables, are considered. For example, from the pre- to post-survey attitude question 10, "How interested are you in learning more about Montana fish and waters where they live?" the following salient details

emerge. First, most students in HOF chose either "very interested" or "sort of interested" on the upper end of the 4-point scale and did not change their choice from pre-survey to post-survey. Second, 582 students of 1778 chose "very interested", and 367 chose "sort of interested" for both pre- and post-survey. Third, 301 students changed their selection from "very interested" to "sort of interested; and only 170 changed from "sort of interested" to "very interested".

The results in this example showed a high level of significance ($p < 0.001$), and that there was overall change in students' attitudes from the pre-survey to the post-survey. However, the change was in a negative direction, which indicated HOF had a negative effect on impacting students' attitudes. This refuted the assumption that over time there would be a greater probability of change toward the upper end of the scale, than toward the lower end.

Table 16.
McNemar-Bowker test for skill outcome for pre-post correlation paired sample results for experimental group.

Question	n	χ^2	*df*	*p-value*	Direction of change[b]
Q24[PP] - Reading and knowing the fishing laws before fishing	1760	15.836	6	0.015*	⇓
Q25[PP] - Carefully, handling a fish you have caught	1753	42.895	6	<0.001***	⇔
Q26[PP] - Carefully, releasing a fish you catch	1750	29.327	6	<0.001***	⇔
Q27[PP] - Carefully, cleaning (or gutting) the fish you catch	1746	64.779	6	<0.001***	⇔
Q28[PP] - Correctly, identifying different kinds of fish	1750	7.793	6	0.254	ns
Q29[PP] - Using different kinds of fishing equipment	1741	29.891	6	<0.001***	⇑
Q31[PP] - Casting your fishing line into the water	1755	35.309	6	<0.001***	⇑
Q32[PP] - Tying good fishing knots in your fishing line	1755	14.405	6	0.025*	⇔
Q33[PP] - Ice fishing	1745	255.108	6	<0.001***	⇑
Q34[PP] - Cleaning up the area where you fish	1752	37.110	6	<0.001***	⇑
Q35[PP] - Following the fishing laws when fishing	1753	16.138	6	0.013*	⇑

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
**p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.*

Table 16 (continued).
McNemar-Bowker test for skill outcome for post- and extended post- correlated paired sample results for experimental group.

Question	n	χ^2	*df*	*p-value*	Direction of change[b]
Q24[PEP] - Reading and knowing the fishing laws before fishing	145	8.597	5	0.126	ns
Q25[PEP] - Carefully, handling a fish you have caught	146	7.249	6	0.298	ns
Q26[PEP] - Carefully, releasing a fish you catch	146	2.821	6	0.831	ns
Q27[PEP] - Carefully, cleaning (or gutting) the fish you catch	145	5.210	6	0.517	ns
Q28[PEP] - Correctly, identifying different kinds of fish	146	3.310	5	0.652	ns
Q29[PEP] - Using different kinds of fishing equipment	146	11.481	5	0.043*	⇓
Q31[PEP] - Casting your fishing line into the water	146	8.392	5	0.136	ns
Q32[PEP] - Tying good fishing knots in your fishing line	145	3.234	4	0.520	ns
Q33[PEP] - Ice fishing	145	4.600	6	0.596	ns
Q34[PEP] - Cleaning up the area where you fish	146	2.087	3	0.555	ns
Q35[PEP] - Following the fishing laws when fishing	145	3.662	6	0.722	ns

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories.
[PEP] Post and Extended Post-survey data for Experimental group only
**p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.*

Most results for skill and knowledge questions were found to be statistically significant and changed in a positive direction from pre- to post-surveys. However, results for the post- to extended post-surveys overwhelmingly showed no statistical significance. Therefore, no change in direction was detected, and indicated students answers did not change.

Skill questions which showed positive change from pre- to post-survey were: "cast fishing line into the water"; "use different kinds of fishing equipment"; "ice fishing"; "clean up the area where you fish"; and "follow fishing laws when fishing". Four other questions showed change in both positive and negative directions. For instance, the skill question 25, "[h]ow well do you know how to carefully handle a fish you have caught?", had more students change their answers from pre-survey to post-survey in a positive direction on the lower end of the scale indicating they felt their skill had improved. However, the students who selected answers on the upper end of the scale on the pre-survey, selected answers lower on the scale for the post-survey, indicating they felt they were not as skilled as they had thought previously. The only skill which remained significant on the extended post-survey was, "using different kinds of fishing equipment", but it changed in a negative direction.

Table 17.
McNemar-Bowker test for knowledge outcome for pre-post correlated paired sample results for experimental group.

Question	N	χ^2	*df*	*p-value*	Direction of change[b]
Q37[PP] - Montana fishing laws	1744	8.219	6	0.223	ns
Q38[PP] - The different native and not (non) native fish in Montana	1744	21.677	6	0.001***	⇔
Q39[PP] - The different names of fish found in Montana waters	1741	15.294	6	0.018*	⇑
Q40[PP] - The things that make good habitat for fish	1736	14.493	6	0.025*	⇑
Q41[PP] - The importance of clean water to people, plants, and animals	1733	29.989	6	<0.001***	⇑
Q44[PP] - The body parts of a fish, and what they do for the fish	1743	114.303	6	<0.001***	⇑
Q45[PP] - The jobs that people have that work with fish and wildlife in Montana	1744	73.322	6	<0.001***	⇑
Q46[PP] - The jobs that people have that work with science and the natural world	1741	32.218	6	<0.001***	⇔

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories.
[PP] Pre-Post survey data for Experimental group only
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

Table 17 (continued).
McNemar-Bowker test for knowledge outcome for post- and extended post-correlated paired sample results for experimental group.

Question	N	χ^2	*df*	*p-value*	Direction of change[b]
Q37[PEP] - Montana fishing laws	146	4.324	5	0.504	ns
Q38[PEP] - The different native and not (non) native fish in Montana	144	5.944	6	0.429	ns
Q39[PEP] - The different names of fish found in Montana waters	146	9.647	4	0.047*	⇑
Q40[PEP] - The things that make good habitat for fish	146	4.329	5	0.503	ns
Q41[PEP] - The importance of clean water to people, plants, and animals	146	3.725	5	0.590	ns
Q44[PEP] - The body parts of a fish, and what they do for the fish	145	5.460	5	0.362	ns
Q45[PEP] - The jobs that people have that work with fish and wildlife in Montana	146	5.340	5	0.376	ns
Q46[PEP] - The jobs that people have that work with science and the natural world	145	10.642	6	0.100	ns

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PEP] Post and Extended Post-survey data for Experimental group only
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

Knowledge questions which were statistically significant and displayed a positive direction of change for pre-post surveys were: "know the different names of fish found in Montana waters"; "things that make good habitat for fish"; "importance of clean water to people, plants, and animals"; "body parts of a fish, and what they do for the fish"; and "jobs that people have that work with fish and wildlife in Montana". Two questions: "the different native and non native fish in Montana"; and "the jobs that people have that work with science and the natural world" showed different directions of change on either end of the scale, again, the positive change was on the lower end of the scale, and the negative change on the upper end. The only knowledge question which continued to be significant

on the extended post-survey was, "know the different names of fish found in Montana waters", and the direction of change was positive. The other questions were not significant, no change, and therefore, no evidence of change in knowledge for the students.

Research Questions

The first research question focused on determining whether the frequency of HOF outdoor experiences significantly affected students' knowledge (Table 18), skills (Table 19), attitudes (Table 20), and intended stewardship behavior (Table 21). The data for correlated paired samples for the experimental group pre-post surveys were compared while controlling for the frequency of HOF outdoor experiences using the McNemar-Bowker test (Marascuillo and McSweeney, 1997).

The null hypothesis was there would be no significant difference in student responses between time one and time two due to the frequency of one or more outdoor experience(s). The alternative hypothesis was a statistically significant difference and change in a positive direction for specific student outcomes would be detected between time one and time two.

Table 18.
McNemar-Bowker test for attitude outcome controlled for frequency of outdoor experience pre-post correlated paired samples for experimental group.

Question	Frequency of Outdoor Experience(s)	n	χ^2	*df*	*p-value*	Direction of Change[b]
Q8[PP]- Think about fish						
	1	470	26.315	10	0.003**	⇓
Q10[PP] - Learn more about fish & water						
	1	468	25.829	6	<0.001***	⇓
	2 - 3	919	33.510	6	<0.001***	⇓
	4 - 5	243	16.226	6	0.013*	⇓

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

Table 19.
McNemar-Bowker test for intended behavior outcome controlled for frequency of outdoor experience pre-post correlated paired samples for experimental group.

Questions	Frequency of Outdoor Experience(s)	n	χ^2	*df*	*p-value*	Direction of Change[b]
Q15b[PP] - Help take care of places in your area where plants, fish and wildlife live						
	4 - 5	243	8.811	3	0.032*	⇓
Q15c[PP] - How things you do might affect plants, fish, and wildlife that live in or near water						
	1	464	28.575	3	<0.001***	⇓
	2 - 3	918	24.206	3	<0.001***	⇓
	4 - 5	240	7.554	3	0.056*	⇓

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

Only two attitude and two intended behavior questions were selected to examine the first research question. They were chosen because they had shown statistical significance, and were specifically related to fish. The results showed statistical significance for one or all of the frequency categories (See Table 18 and 19 for p-values), "1 time ", "2-3 times", and "4-5 times". However, the directions of change were all in the negative direction, which indicated negative association.

Table 20.
McNemar-Bowker test for skill outcome controlled for frequency of outdoor experience pre-post correlated paired samples for experimental group.

Questions	Frequency of Outdoor Experience(s)	n	χ^2	*df*	*p-value*	Direction of Change[b]
Q24[PP] - Reading and knowing the fishing laws before fishing	2 - 3	919	18.735	6	0.005**	⇔
Q25[PP] - Carefully, handling a fish you have caught	2 - 3	918	43.963	6	<0.001***	⇑
	4 - 5	222	16.253	6	0.012*	⇑
Q26[PP] - Carefully, releasing a fish you catch	2 - 3	915	21.522	6	0.001***	⇓
	4 - 5	223	15.830	6	0.015*	⇔
Q27[PP] - Carefully, cleaning (or gutting) the fish you catch	1	465	21.197	6	0.002**	⇑
	2 - 3	912	39.125	6	<0.001***	⇑
	4 - 5	222	17.596	6	0.007**	⇑
Q29[PP] - Using different kinds of fishing equipment	1	464	14.547	6	0.024*	⇑
	2 - 3	907	12.305	6	0.056*	⇑
	4 - 5	220	17.593	6	0.007**	⇑
Q31[PP] - Casting your fishing line into the water	2 - 3	915	31.343	6	<0.001***	⇑
Q32[PP] - Tying good fishing knots in your fishing line	1	467	17.348	6	0.008**	⇑
Q33[PP] - Ice fishing	1	463	21.565	6	0.001***	⇑
	2 - 3	910	197.780	6	<0.001***	⇑
	4 - 5	223	68.571	6	<0.001***	⇑
Q34[PP] - Cleaning up the area where you fish	2 - 3	915	40.649	6	<0.001***	⇑
Q35[PP] - Following the fishing laws when fishing	2 - 3	915	18.211	6	0.006**	⇑

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

The McNemar-Bowker analyses for the skill questions demonstrated high levels of significance in a positive direction for 10 questions. These questions focused on handling, releasing, and cleaning fish; reading, knowing, and following fishing laws; and using different fishing equipment, casting fishing line, tying good fishing knots, and ice fishing. These results were statistically significant for the "2 to 3 times" and "4 to 5 times" categories. Two skill questions showed positive and negative change in direction. They were: "releasing a fish" for category "4 to 5 times" which was negative on the upper end of the 4-point scale, and positive on the lower end. The second skill question, "reading and knowing fishing laws before fishing" for category "2 to 3 times", was also negative on the upper end of the scale, but positive for the lower end.

Table 21.
McNemar-Bowker test for knowledge outcome controlled for frequency of outdoor experience pre-post correlated paired samples for experimental group.

Questions	Frequency of Outdoor Experience(s)	n	χ^2	*df*	*p-value*	Direction of Change[b]
Q37[PP] - Montana fishing laws	2 - 3	914	12.935	6	0.044*	⇑
Q38[PP] - The different native and not (non) native fish in Montana	2 - 3	914	27.926	6	<0.001***	⇑
Q39[PP] - The different names of fish found in Montana waters	2 - 3	910	13.451	6	0.036*	⇑
Q40[PP] - The things that make good habitat for fish	2 - 3	907	16.430	6	0.012*	⇑
Q41[PP] - The importance of clean water to people, plants, and animals	2 - 3	906	30.109	6	<0.001***	⇑
Q44[PP] - The body parts of a fish, and what they do for the fish	0	120	23.470	6	0.001***	⇑
	1	463	38.232	6	<0.001***	⇑
	2 - 3	910	58.029	6	<0.001***	⇑
	4 - 5	223	14.951	6	0.021*	⇑
Q45[PP] - The jobs that people have that work with fish and wildlife in Montana	0	121	22.581	6	0.001***	⇑
	1	462	17.181	6	0.009**	⇑
	2 - 3	914	50.703	6	<0.001***	⇑
Q46[PP] - The jobs that people have that work with science and the natural world	2 - 3	911	28.229	6	<0.001***	⇑

Note.
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
[PP] Pre-Post survey data for Experimental group only
*$p \leq 0.05$. **$p \leq 0.01$. ***$p \leq 0.001$.

The analyses for the knowledge questions demonstrated high levels of significance in a positive direction. These eight questions focused on fishing

laws; different names of fish, different native and non-native fish, body parts of a fish and what they do for the fish; things that make good fish habitat, importance of clean water; and jobs people have related to fish and wildlife, science, and natural world. The significant results were predominantly for the "2 to 3 times" category, although "body parts of a fish" and "jobs related to fish and wildlife in Montana" were also significant in a positive direction for the category "0". This was probably because the students were able to learn about these items both in and out of the classroom.

The second research question, "[d]oes improved knowledge of local natural resources affect students' skills, attitudes and intended stewardship behavior?" was also addressed using the McNemar-Bowker test. The variables controlled for were post-survey knowledge questions with observed positive change results. Only skill questions were used in this analysis, because the findings for attitude and intended behavior questions were not significant, and had changed in negative directions.

The null hypothesis was that there would be no significant change in students' skills, attitudes, and intended behaviors as a result of increased knowledge. The alternative hypothesis was a significant change in a positive direction would be detected for outcomes associated with increased knowledge from time one to time two. Table 22 provides the results of the McNemar-Bowker test for the correlated paired samples while controlling for increased knowledge outcome questions at the time of post-survey.

Table 22.
McNemar-Bowker test controlled for increased knowledge outcome with correlated paired samples for pre-post survey skill outcomes for experimental group.

Knowledge Outcome	Skill Outcome - Pre-Post Surveys	n	χ^2	*df*	*p-value*	Direction of change[b]
Q38[P] - The different native and not (non) native fish in Montana	Q28[PP] - Correctly, identifying different kinds of fish					
Don't know much		583	19.483	6	0.003**	⇓
Know some		652	22.426	6	0.001***	⇔
Know a lot		238	15.632	5	0.008**	⇑
Q39[P] - The different names of fish found in Montana waters	Q28[PP] - Correctly, identifying different kinds of fish					
Don't know much		407	18.784	6	0.005**	⇓
Know some		826	23.216	6	0.001***	⇔
Know a lot		418	16.124	6	0.013*	⇑
Q40[P] - The things that make good habitat for fish	Q34[PP] - Cleaning up the area where you fish					
Know some		726	21.849	6	0.001***	⇑
Know a lot		705	31.596	6	<0.001***	⇑
Q41[P] - The importance of clean water to people, plants, and animals	Q34[PP] - Cleaning up the area where you fish					
Know some		517	22.890	6	0.001***	⇔
Know a lot		1116	41.610	6	<0.001***	⇑

Note.

[P] Post- Student Survey Question
[PP] Pre- and Post- Student Survey Question - Correlated Paired Sample
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

Table 22 (continued).
McNemar-Bowker test controlled for increased knowledge outcome with correlated paired samples for pre-post survey skill outcomes for experimental group.

Knowledge Outcome	Skill Outcome - Pre-Post Surveys	n	χ^2	*df*	*p-value*	Direction of change[b]
Q44[P] - The body parts of a fish, and what they do for the fish	Q25[PP] - Carefully, handling a fish you have caught					
Know some		743	34.276	6	<0.001***	⇔
Know a lot		617	36.604	6	<0.001***	⇑
Q44[P] - The body parts of a fish, and what they do for the fish	Q26[PP] - Carefully, releasing a fish you catch					
Don't know much		323	21.419	6	0.002**	⇔
Know some		739	18.587	6	0.005**	⇔
Know a lot		618	13.169	6	0.040*	⇔
Q44[P] - The body parts of a fish, and what they do for the fish	Q27[PP] - Carefully, cleaning (or gutting) the fish you catch					
Don't know much		324	19.687	6	0.003**	⇔
Know some		740	33.920	6	<0.001***	⇑
Know a lot		615	55.483	6	<0.001***	⇑

Note.

[P] Post- Student Survey Question
[PP] Pre- and Post- Student Survey Question - Correlated Paired Sample
[b] Change in positive ⇑ direction; positive & negative ⇔ directions; negative ⇓ direction for each attribute based on the scale of ordinal categories
*p ≤ 0.05. **p ≤ 0.01. ***p ≤ 0.001.

The post-survey knowledge questions used as control variables were: "different names of fish", "different native and non-native fish", "body parts of a fish and what they do for a fish", "things that make good fish habitat", and "importance of clean water". The answer categories were: "don't know anything";

"don't know much"; "know some"; and "know a lot". The correlated paired sample skill variables were: "correctly identifying different kinds of fish", "cleaning up the area where you fish", and "carefully handling a fish", "carefully releasing a fish", and "carefully cleaning a fish".

The statistical analysis demonstrated significance in a positive direction for all questions, except for one knowledge and skill association for the "know a lot" category level. This exception was the association between, "body parts of a fish" and "carefully, releasing a fish", which was statistically significant, but in both positive and negative directions. The direction of change was mostly in a positive direction on the lower end of the 4-point scale. The positive changes were from: "not very well" to "very well", "don't know how at all" to "pretty well", and "don't know how at all" to "not very well". The upper end of the scale had a negative change in direction. These findings indicated self-reported skill improvement was associated with improved knowledge and was statistically significant.

Teacher Internet Survey

The purpose was to determine how effectively HOF provided outdoor skills and content for teachers interested in using the outdoor environment coupled with classroom activities to teach students about fish, natural resources, and local conservation issues.

One hundred fourteen teachers were sent emails requesting their participation in an on-line survey, 101 (88.6%) responded. The reason for the difference between the number of HOF classrooms (n = 132) and the number of HOF teachers (n = 114) is accounted for by the fact that some teachers teach in more than 1 classroom.

The results addressed the following survey topics and are presented in the same order:

1. The general interest and educational expectations teachers had for HOF.
2. The teachers' ratings of HOF activities in 2005-06.
3. The benefits HOF has for teachers and students.
4. The description of HOF outdoor field experiences for teachers and students.
5. How HOF activities have affected student outcomes.
6. Challenges of being a teacher involved in HOF program
7. Suggestions to improve HOF
8. Recommendations for future HOF teachers
9. General comments about HOF

Quantitative Results

Teachers were asked what initially interested them in the HOF program (Figure 24).

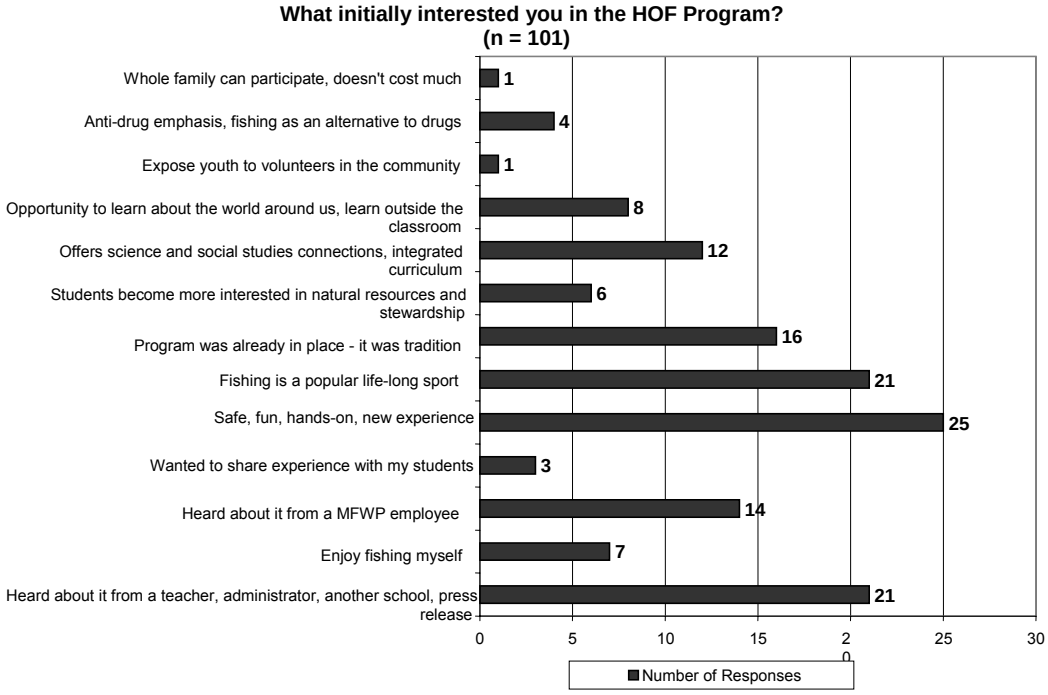

Figure 24. The reasons teachers were initially interested in the HOF program.

The majority of HOF teachers had a general interest in the program because it provided "safe, hands-on, and new experiences" for their students to develop a "popular lifelong skill" that they could do with friends and family.

When asked what their main educational expectations were for including HOF in the curriculum (Figure 25), 57% said because it meets required science & health curriculum teaching objectives and related science topics. Teachers (48%) said it was included because the students are able to learn a lifelong skill and gain appreciation for fish and the outdoors.

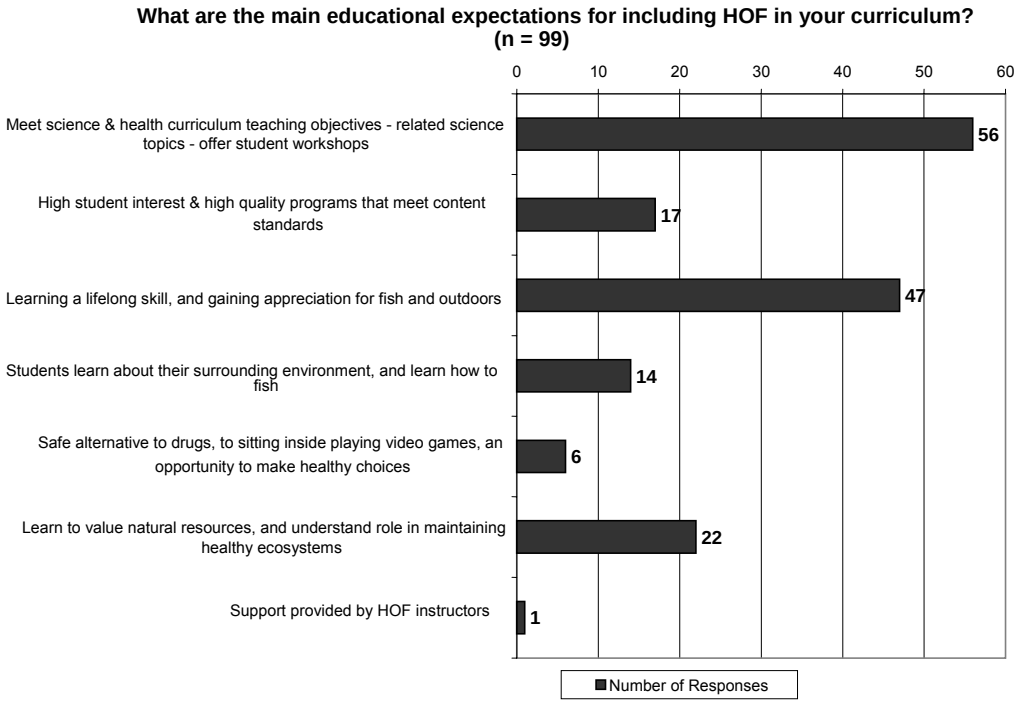

Figure 25. The main educational expectations teachers had for including HOF in their school curricula.

These results beg the question, what educational expectations are not being met? Nine teachers addressed this question. Their top two unmet expectations were: (1) too little exposure was given to the ethics of fishing; and (2) the field trip activities were inadequately associated to their school's education requirements - i.e., how field trip was tied to water cycle activities.

Three teachers had specific expectations that were unmet, these were: (1) disappointed their class never went fishing, they wondered if they were supposed to find their own fishing guide; and (2) they had several different instructors presenting at their school, but thought there would only be one; and (3) they wanted the "not on drugs" portion of the program - they felt it was like false

advertising - with background research to pass on to their students about a "natural high" versus choosing other drug related alternatives.

Were teachers spending more time teaching their students about fish, wildlife and natural resources as a result of HOF? Figure 26 demonstrates that HOF increased the amount of time these subjects were taught by 88%.

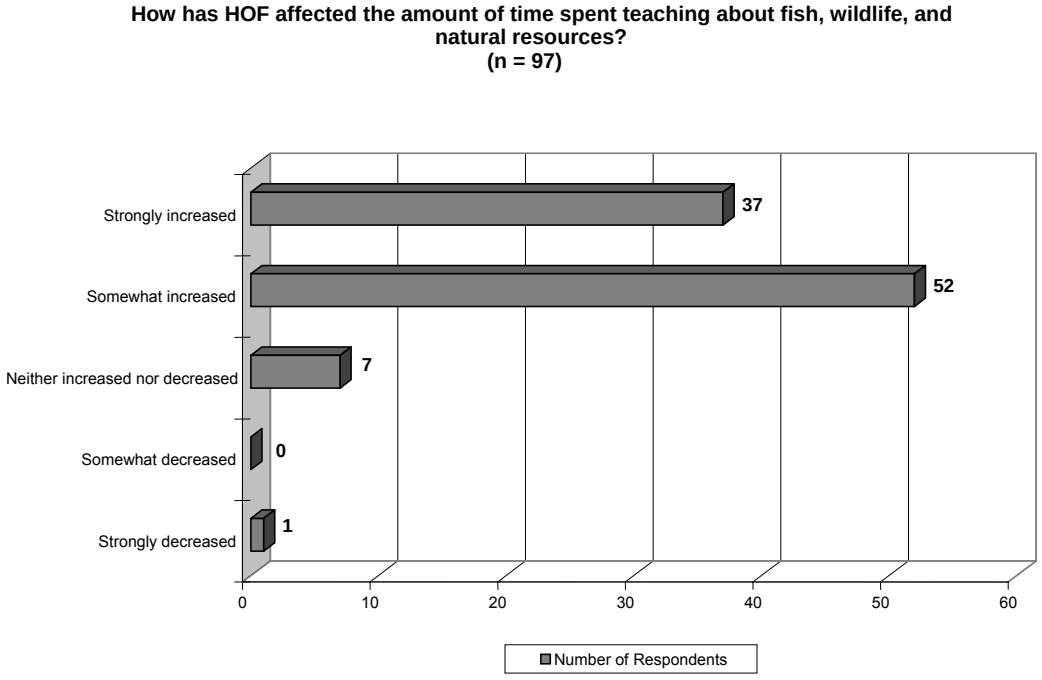

Figure 26. How the HOF program affected the amount of time teachers spent teaching about fish, wildlife, and natural resources.

Teachers were asked to consider and then rate the HOF activities they did with their students in 2005-06 (Figures 27 and 28).

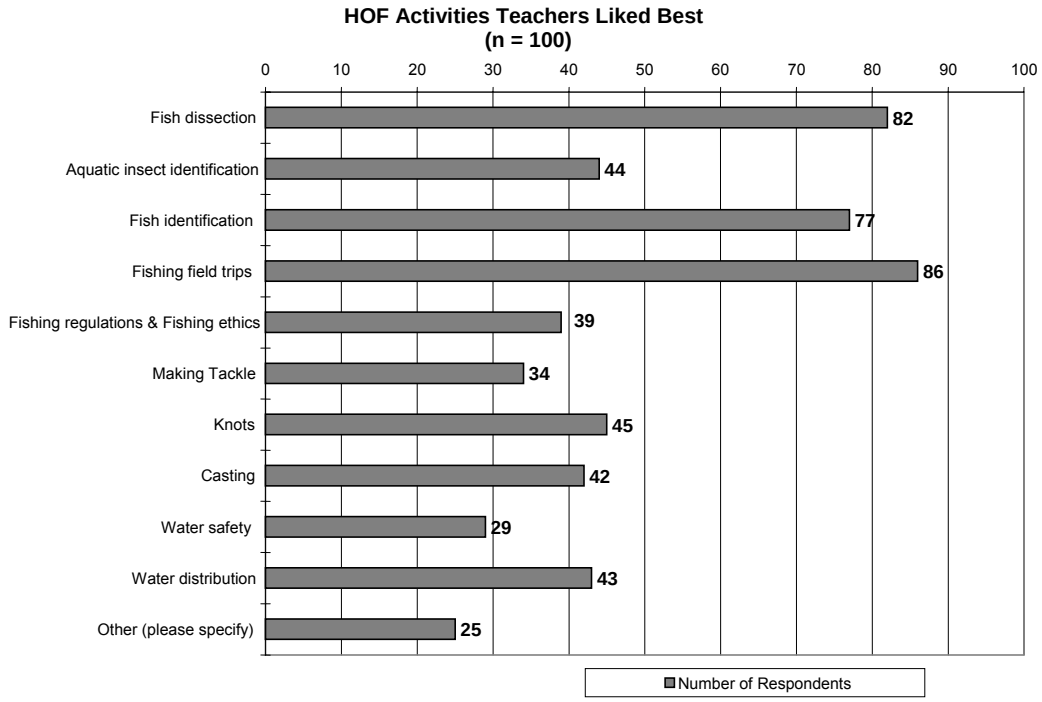

Figure 27. The HOF activities teachers liked best.

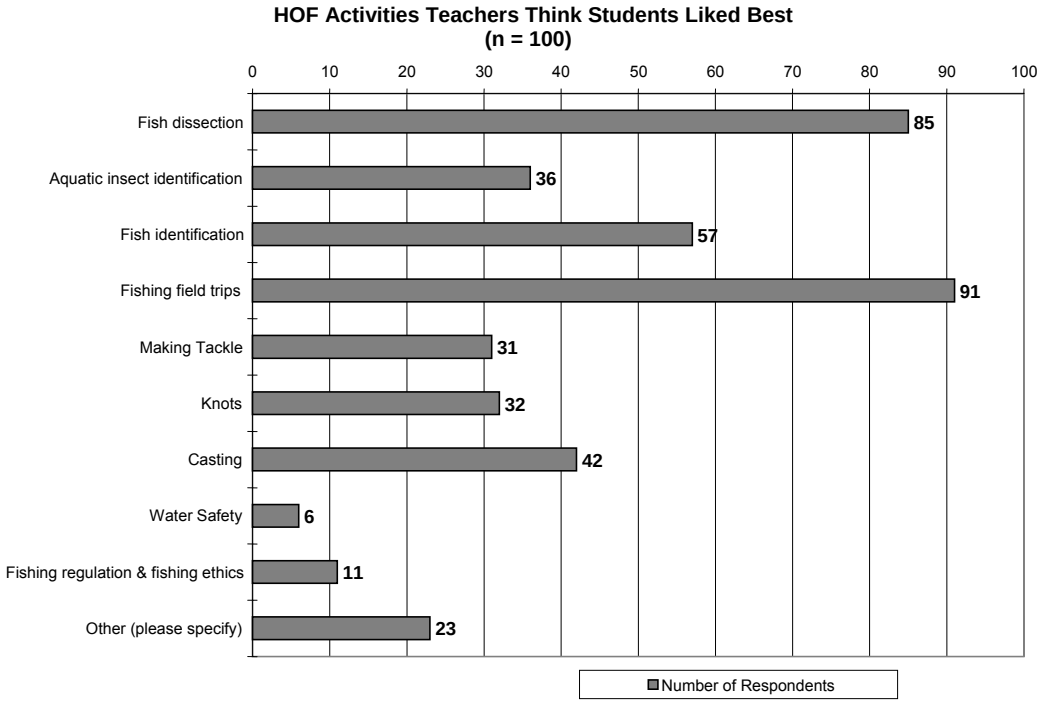

Figure 28. The HOF activities teachers thought students liked best.

Teachers thought students liked "fishing field trips" best, followed by, "fish dissection". When, in fact, the students reported their favorite HOF activity was "fish dissection", followed by "fishing". This was good news, because teachers were asked to rate the HOF activities on a 5-point scale from "superior" to "not very good" with an option of "not applicable" because they did not get the chance to participate (Figure 29). Approximately 80% of the teachers rated "fish dissection" as a "superior to excellent" activity. They were also asked to rate the overall effectiveness of the six major program components (Figure 30).

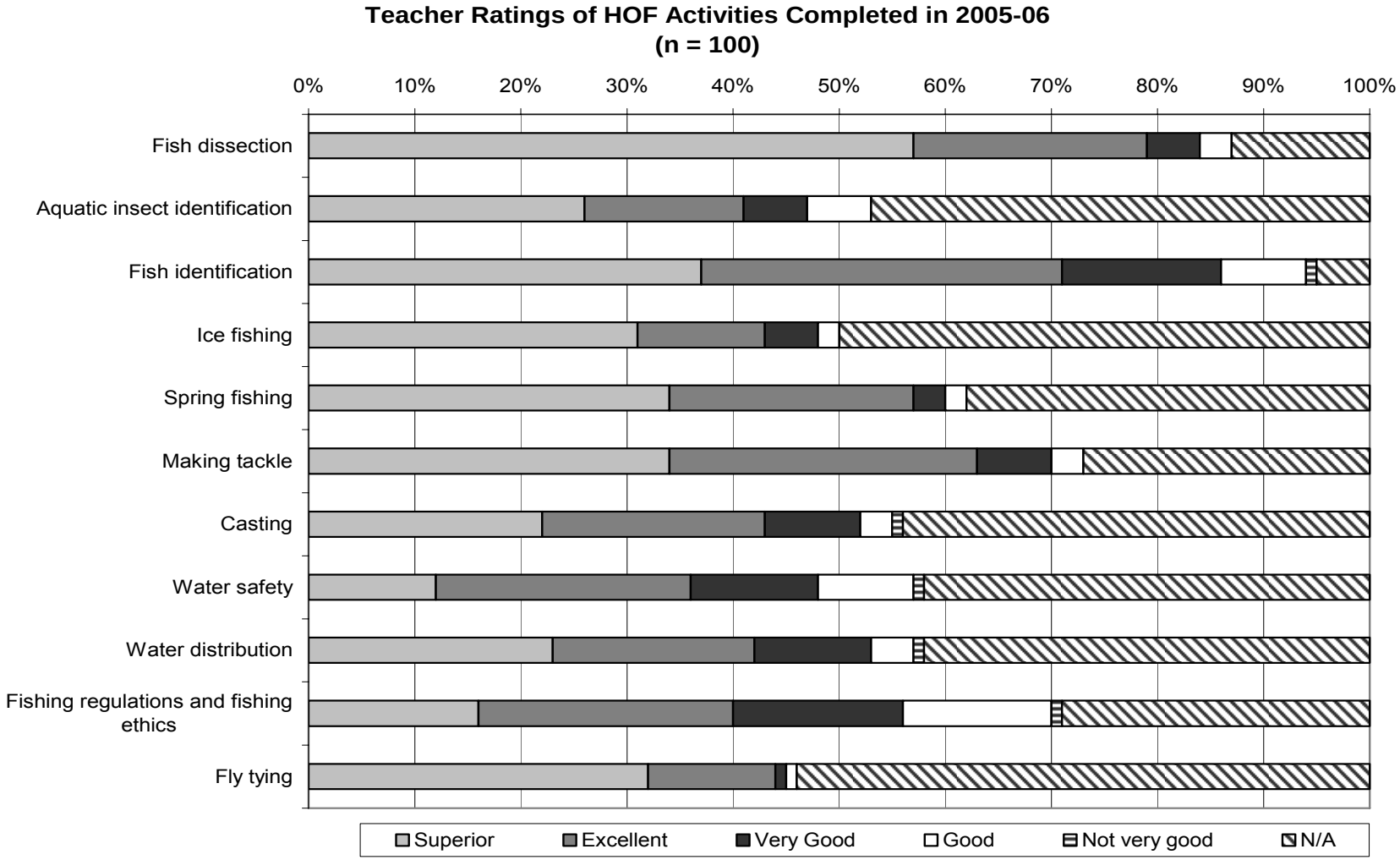

Figure 29. Teachers' ratings for HOF activities completed with students in 2005-06.

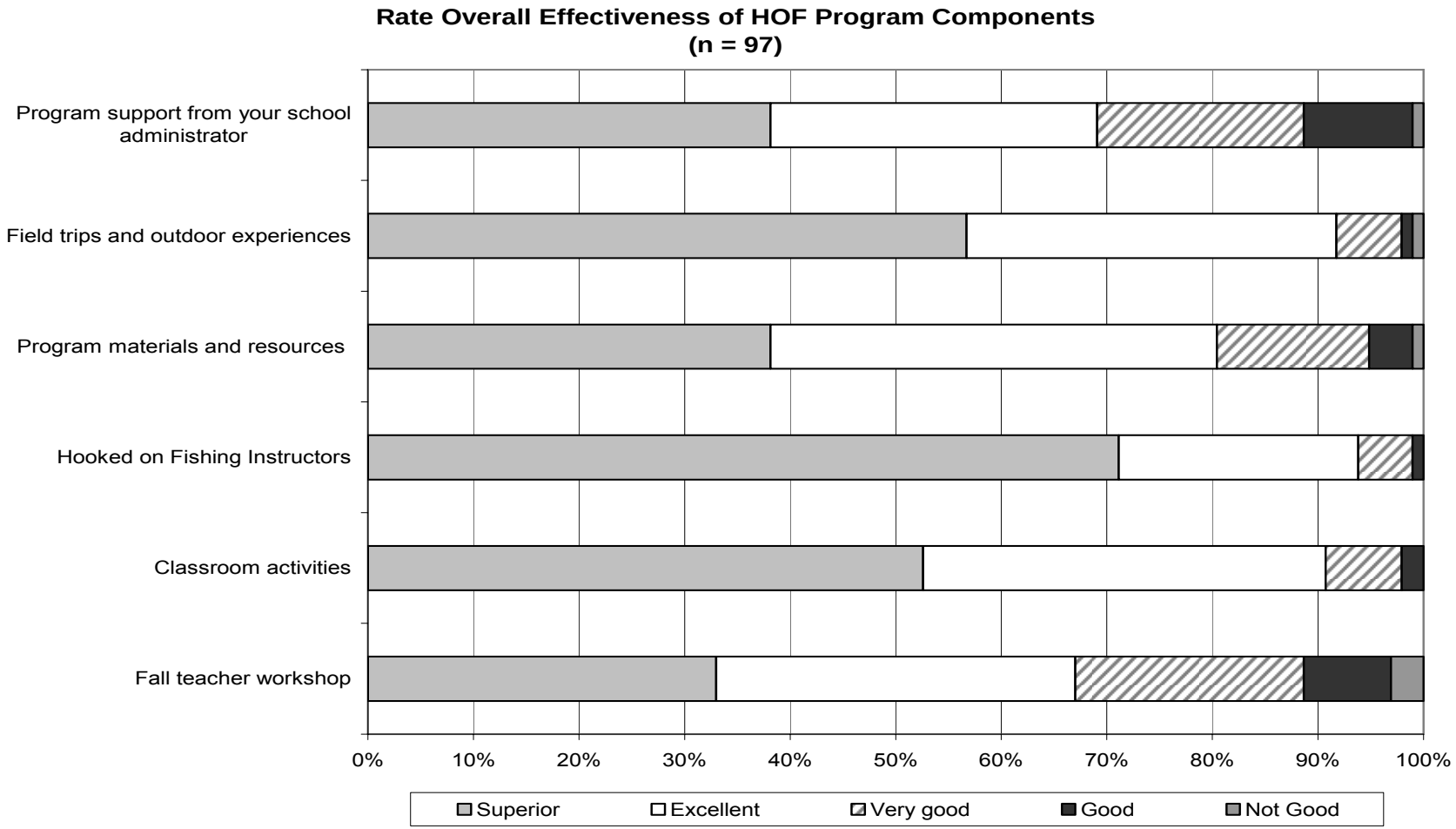

Figure 30. Teachers' ratings for the overall effectiveness of HOF program components.

Fish dissection and identification activities were given superior ratings by most teachers. These activities continued to receive the same rating when superior, excellent, and very good categories were considered together. Ice fishing, fly tying, and aquatic insect identification were rated "not applicable" by 50% of HOF teachers, which indicated that these were activities they were not doing due to weather, time, or the activity was not offered by instructors in their region.

Most teachers (86%) preferred to have HOF program activities spread out over the entire school year, rather than offering the program in one block of time. It was important to explore what benefits teachers felt HOF had for them and for their students (Figures 31 and 32).

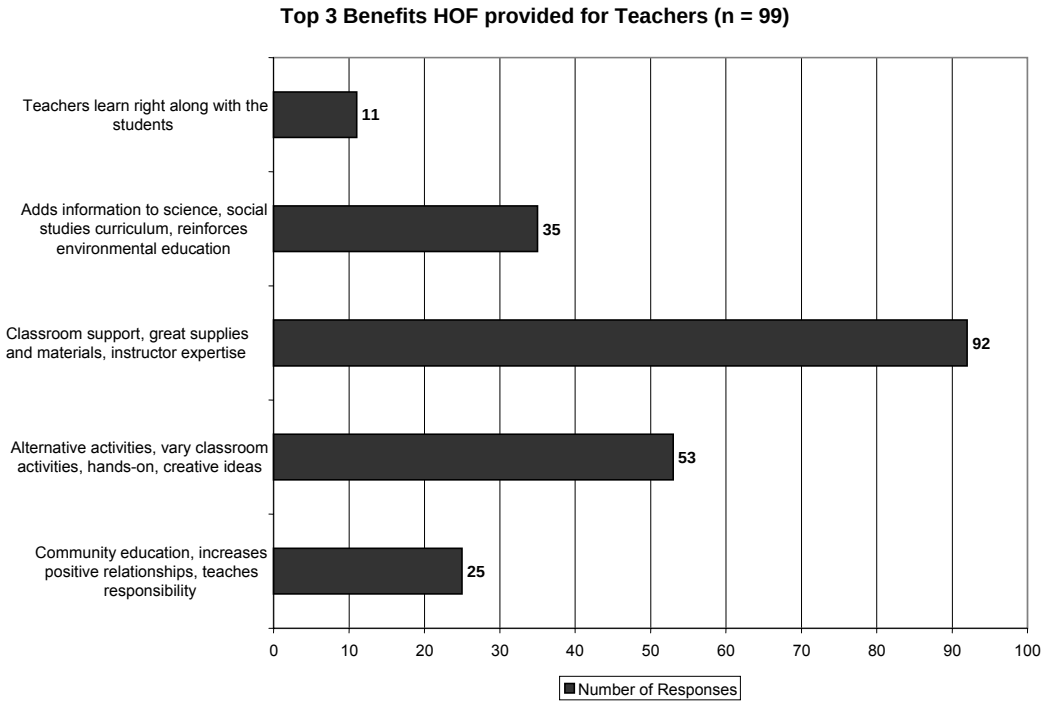

Figure 31. The top three benefits HOF provided for teachers.

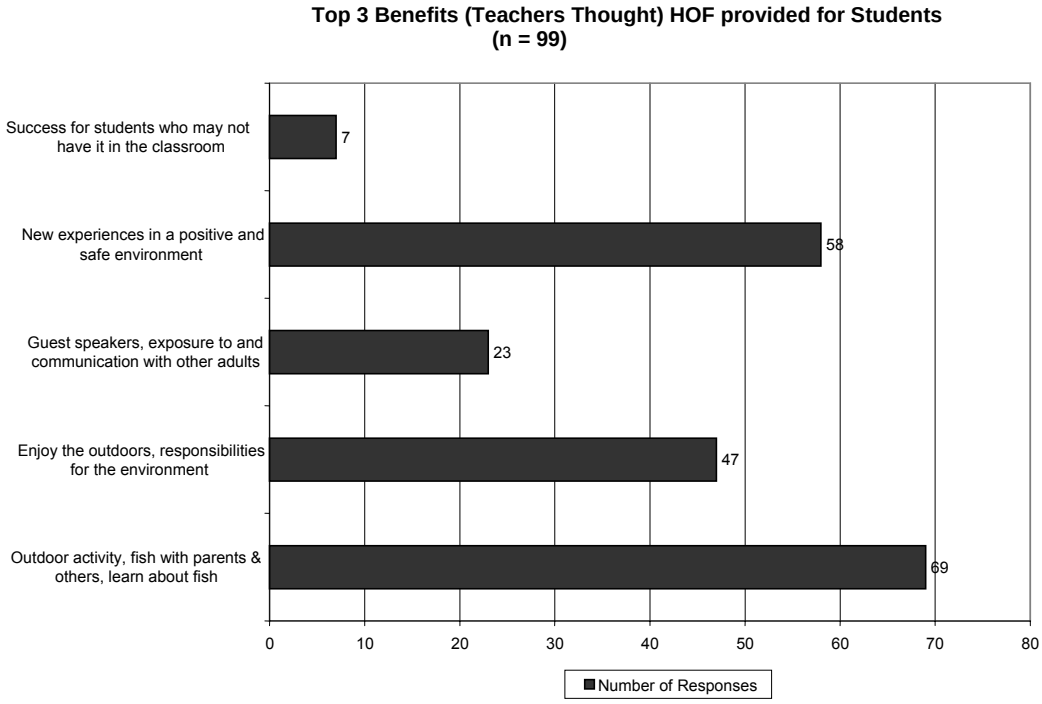

Figure 32. The top three benefits teachers thought HOF provided for Students.

The HOF program benefited classroom teachers by providing "instructors with expertise", "great supplies and materials", and "classroom support" to do "alternative activities" with the students. The teachers felt HOF benefited students by providing "outdoor activities" and "opportunities to fish with parents and others" in a "positive and safe environment", and to "learn about fish". These benefits have "somewhat" to "strongly" increased the amount of time teachers spend teaching students about fish, wildlife, and natural resources.

The teachers were asked to help describe the outdoor field experiences they had in 2005-06. They were asked to reveal the number of times they participated in outdoor HOF activities (Figure 33), the major types of outdoor

experiences they had (Figure 34), and the ratings they gave these experiences for themselves and their students (Figures 35 and 36).

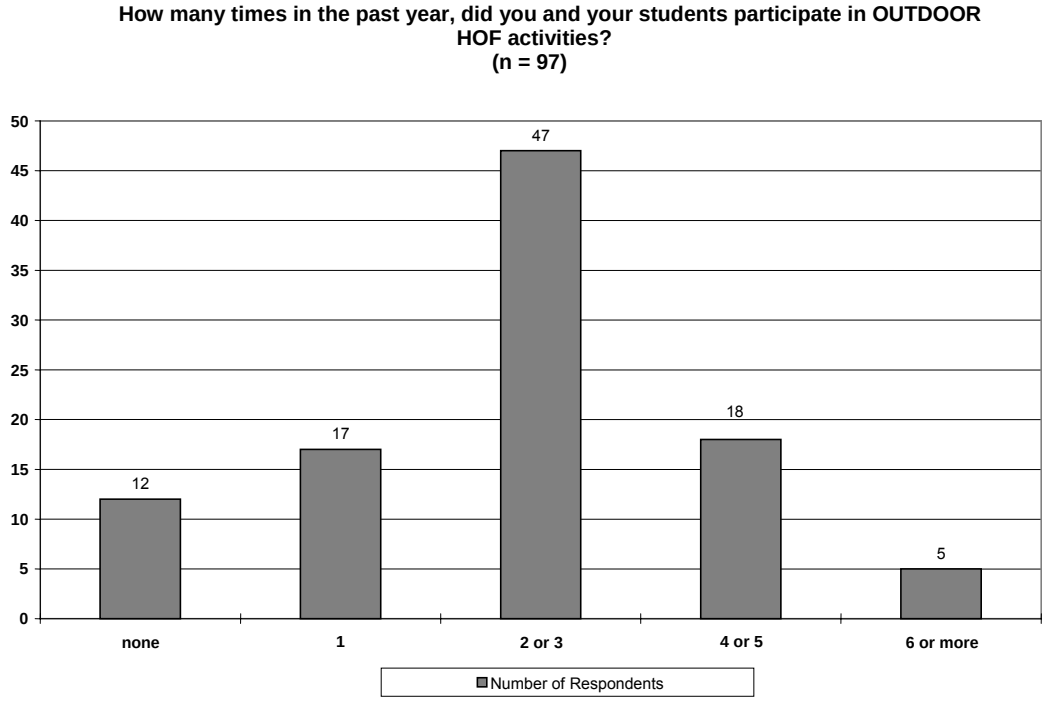

Figure 33. The number of times teachers and students participated in outdoor HOF activities during 2005-06.

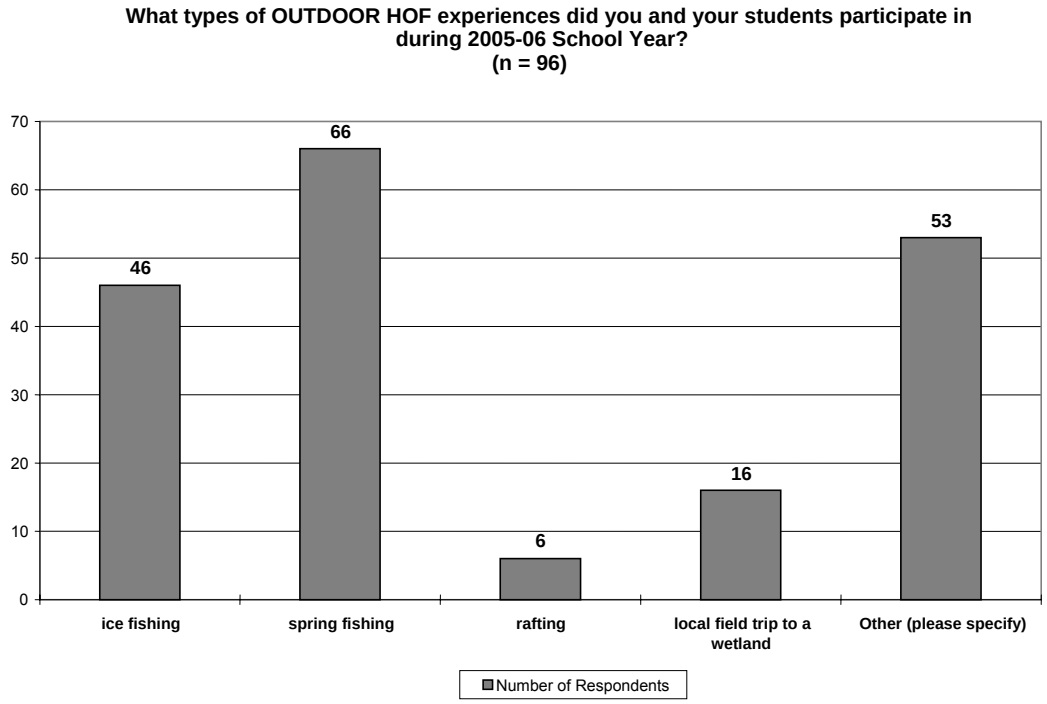

Figure 34. The major types of outdoor HOF activities teachers and students experienced during 2005-06.

Teachers were asked to describe "other" outdoor activities (Figure 34) they experienced. These were: outdoor casting practice, fall fishing, and collecting fish with the MFWP fisheries biologist.

Eighty-eight percent of the teachers took their students outdoors at least once during the school year, and 49% took students outdoors 2 or 3 times. The purpose was mostly to participate in a fishing trip to a local body of water.

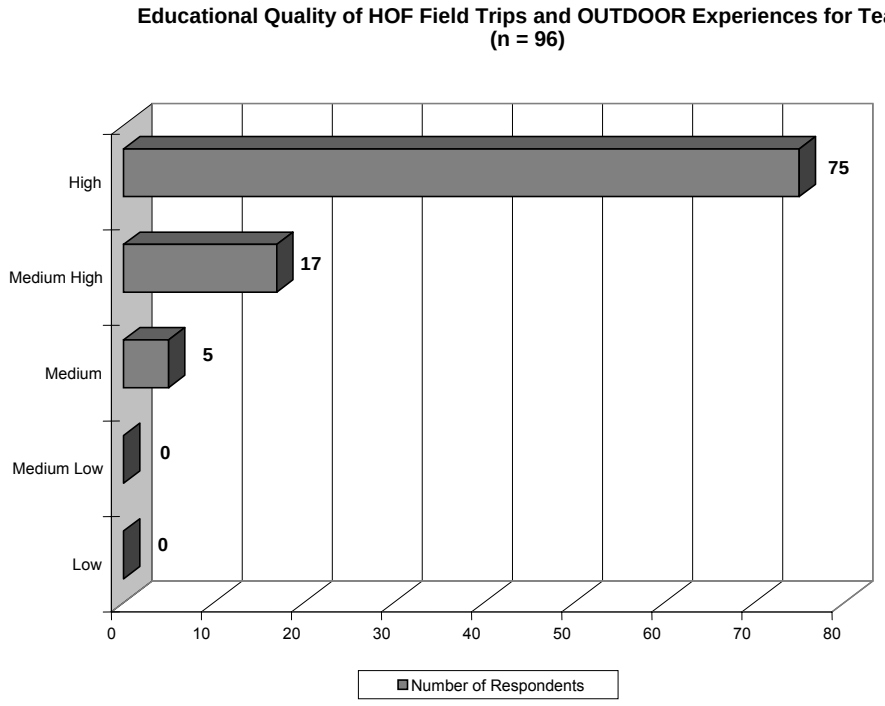

Figure 35. Teachers' ratings for the educational quality of HOF field trips and outdoor experiences.

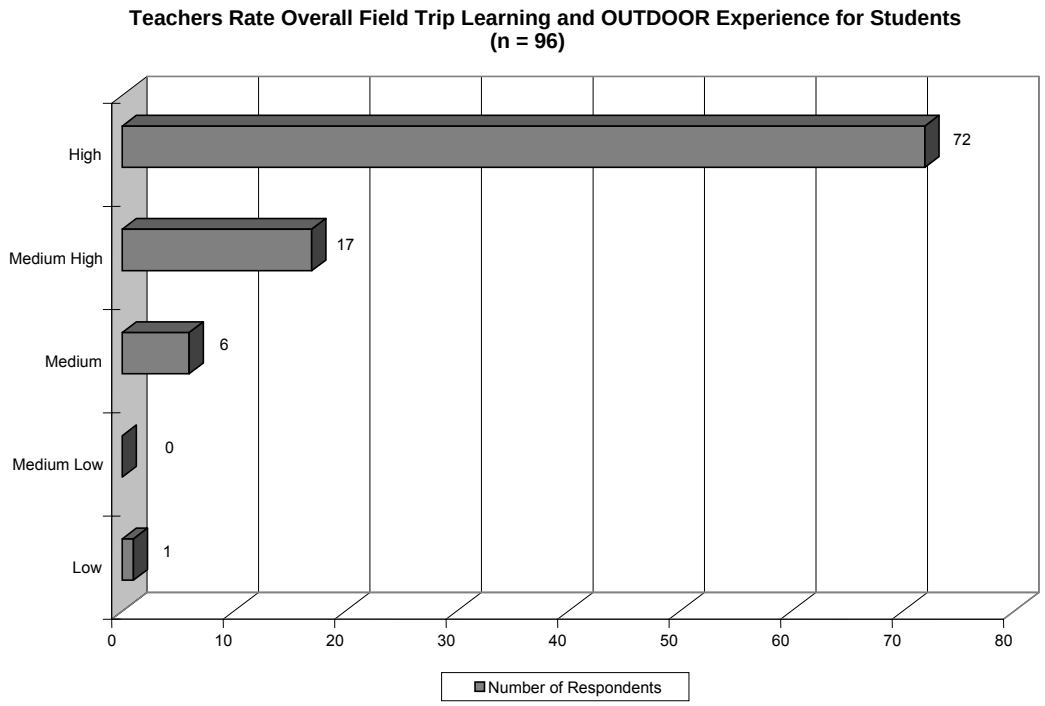

Figure 36. Teachers' ratings for the overall quality of learning during field trips and outdoor experience for students.

Most teachers rated the quality of the HOF field trips and outdoor experiences a "high" rating on a 5-point scale for themselves and the students. They were asked how they thought the HOF activities affected students' knowledge, skills, attitudes, stewardship and recreational behaviors (Figure 37).

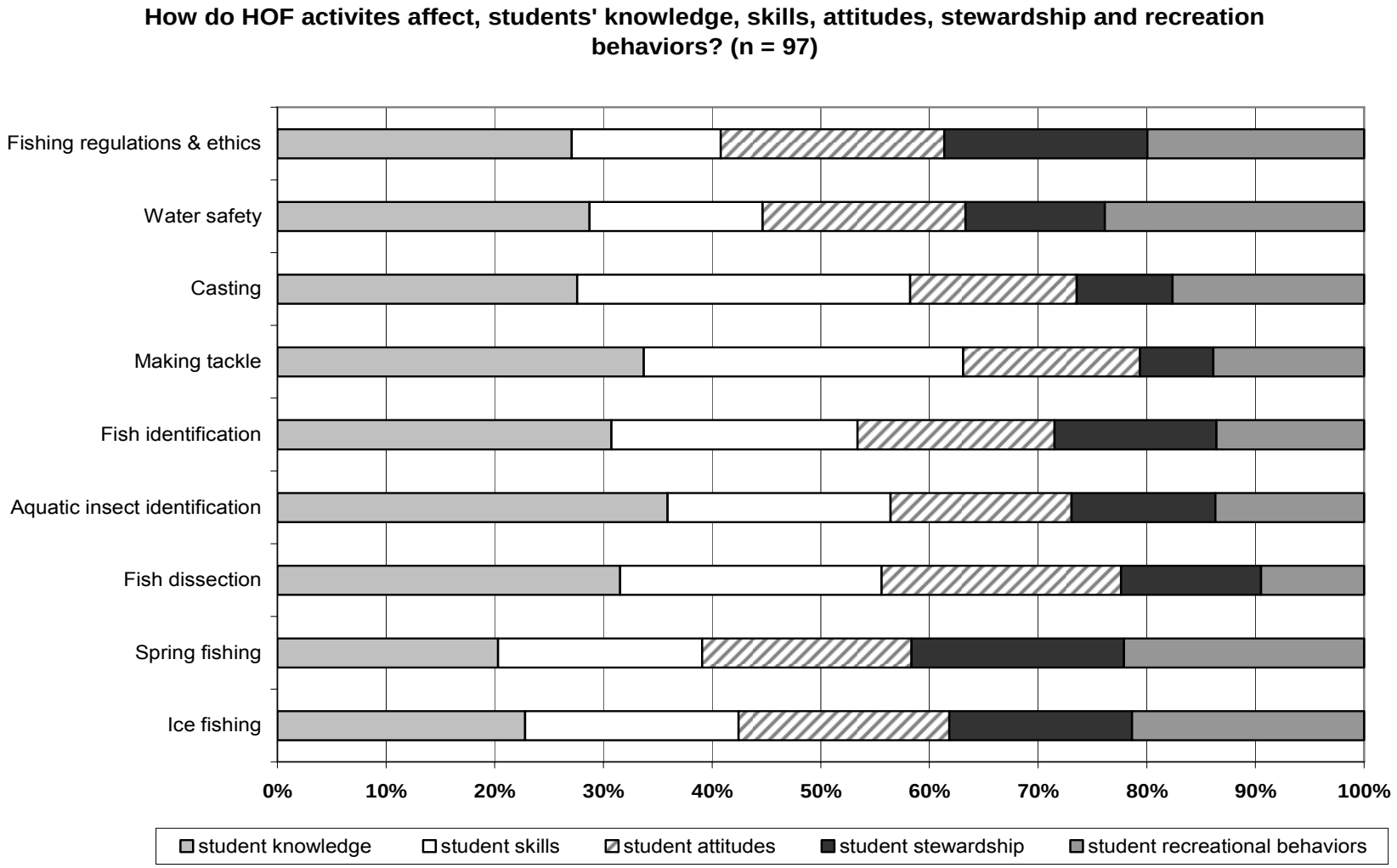

Figure 37. Teachers' selections for how much HOF activities affected students' knowledge, skills, attitudes, stewardship, and recreational behaviors.

Approximately 40% of the teachers thought HOF activities affected student knowledge, and skills when considered together, however when separated knowledge was selected most often for all activities except spring fishing and casting. Stewardship and recreational behaviors were selected least often as having an effect.

Teachers were asked how they thought HOF had impacted the likelihood that their students would continue to fish (Figure 38) and how HOF affected students' attitudes that had never fished before or had few outdoor opportunities (Figure 39).

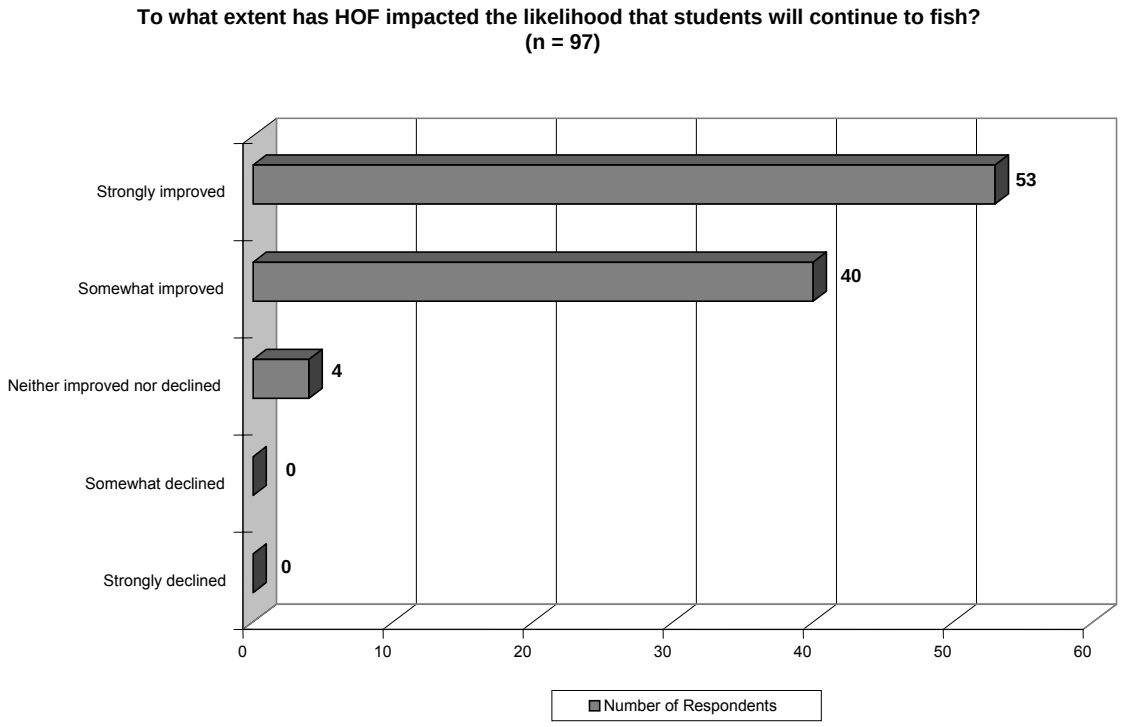

Figure 38. Teachers' ratings for how HOF impacted the likelihood that students would continue to fish.

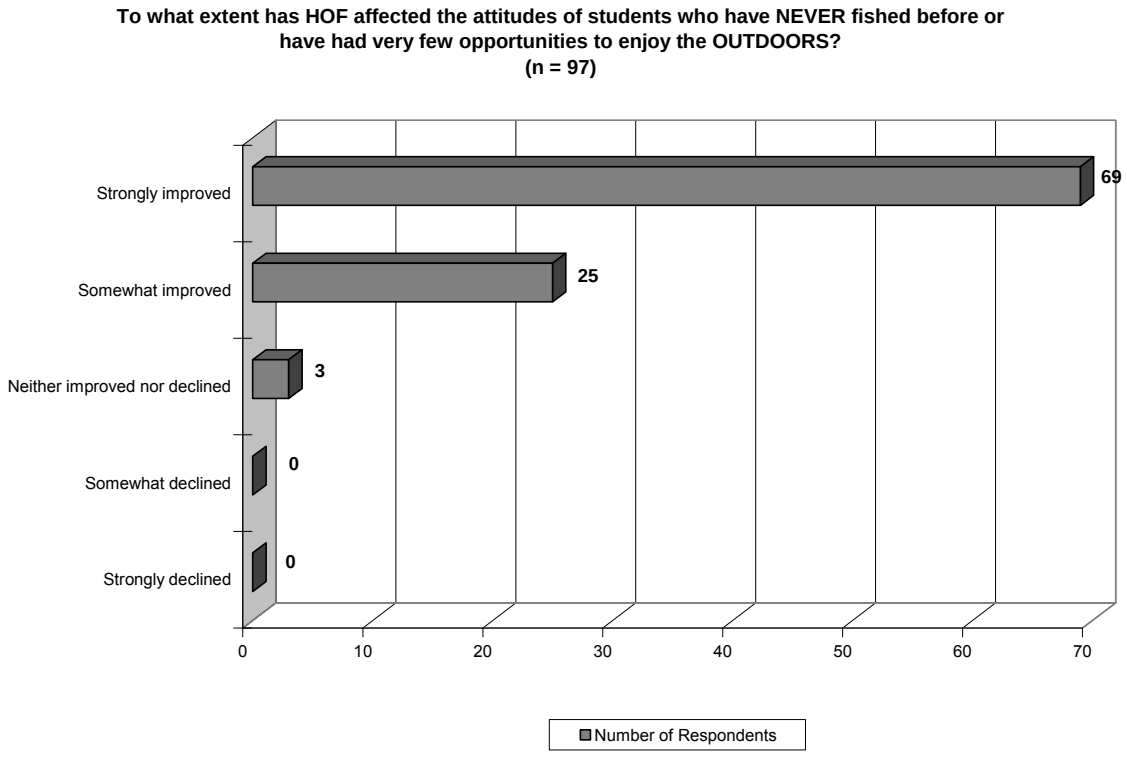

Figure 39. Teachers' ratings for how HOF affected the attitudes towards fishing and stewardship for students who had never fished or had few opportunities to enjoy the outdoors.

Practically all teachers rated the HOF program as having "strongly improved" to "somewhat improved" the likelihood that students would continue to fish. For students who had never fished or had few previous outdoor experiences, teachers felt HOF had "strongly improved" these students' attitudes about fishing, stewardship, and enjoying the outdoors.

Qualitative Results

Teachers recommended that future HOF teachers have clear behavioral expectations of students on field trips, develop a formal invitation to send to parents and other adults to participate in HOF, make HOF an important part of

the school curriculum, and have the desire to improve students' awareness of the outdoors.

Three major themes emerged from suggestions teachers had for improving HOF (Appendix E, p. 231). They were: (1) new ideas for HOF activities; (2) different ways to structure the program; and (3) cost assistance for bus transportation. The suggestions for new activities were: develop reading materials as extension lessons; cooperative activities for students to take home to do with parents; and a catch-and-release policy promoted for the program so fish aren't wasted. One of the most innovative ideas suggested by a teacher was; "to see the students become more involved in something that seems substantial to them…think it would be a valuable addition to the program to have classes adopt sections of river or fishing access sites that they keep clean and can take some pride in… think it would be very beneficial for the students to see how much effort goes into keeping areas clean".

Most challenging parts of being a HOF teacher (Table 23) were trying to coordinate "when to do the activities and field trips, and trying to fit it all in", and "not being a fisherperson". Other, less prevalent themes were: funding and support for "fun" field trips from school administration; unpredictable weather, pre-work to prepare students for visiting HOF instructors; and unappreciative student attitudes and behaviors while fishing.

Table 23. The challenges of being a HOF teacher.

Challenges	n	%
▪ Coordinating when to do activities and field trips, and time to get it all in.	21	26
▪ Not a fisherperson.	8	10
▪ Having to justify the "fun" to administration; convincing principal to let us participate in all the activities offered; support to go on fishing trips.	5	6
▪ Keeping students prepared for visiting instructors - pre-work.	4	5
▪ School bus transportation and funding for field trips.	4	5
▪ Weather, lack of cold for ice fishing.	3	4
▪ Keeping track of when the instructors are scheduled to come to the classroom.	2	3
▪ Coming up with enough activities and materials on my own.	2	3
▪ I was raised to appreciate where I was fishing, more than the amount of fish I caught. Students often don't appreciate the opportunities given to them. It's frustrating as a teacher to see certain attitudes and inappropriate behaviors.	2	3
▪ Start the program on time, and spread out during the school year.	1	1
▪ Lack of parent help/assistance.	1	1
▪ Rigging up my students' poles for fishing and finding fish bait.	1	1
▪ New to the program and trying to learn the program.	1	1
▪ Getting all the entries together for the State Fish Art Contest.	1	1
▪ Challenges teachers to place more emphasis on outdoor education.	1	1
▪ Taking care of the fish tank (aquarium).	1	1
▪ Fishing trips.	1	1

Teachers were invited to make final comments about HOF (Appendix E, p. 231). There were four pertinent examples that provide anecdotal evidence to support how effective HOF has been for teachers and their students.

- This is an excellent program that introduces many students to outdoor activities that they might otherwise never have had the opportunity to experience. The joy on a student's face when they have caught their first fish ever is phenomenal! The program helps students with their patience and perseverance. Some have to learn that they can do all of the right things and not catch a fish on any given trip and yet they can still have fun and enjoy the camaraderie and outdoors. Thanks for putting together this wonderful program!
- We are grateful for this program. It has had a very powerful impact on our school and the students' attitudes. The quality of instruction, variety of activities, flexibility of scheduling, and patience of (the) presenters have brought about a deep appreciation and respect for Montana fisheries and wildlife. Thank you!
- I hope it can continue to be funded, because it is one of the special things we can offer here in Montana which has a lasting impact on students and the environment. It also involves parents in ways that I have not seen in any other program during my 20+ years in education, and it involves parents who may not normally volunteer in school/classroom activities.
- I found this program to be the single most influential experience my students were exposed to. They learned, they grew as students, and they gained confidence as they experienced nature and developed new skills. They also developed teamwork and a sense of responsibility. I found lots of opportunities to spin other academics from their interest in fishing.

Instructors' Structured Open-ended Interview

The purpose was to gain a more in-depth understanding of the students' self-reported pre-post answers to the survey questions, and to compare the results with the HOF teacher survey results. Eighty-two percent of the instructors (n = 16) learned about HOF from someone at MFWP. The others learned about it from another teacher, a newspaper article, or the national HOFNOD program. All instructors participated in the telephone interview and each interview was transcribed verbatim. The content analysis (Patton, 2002a) was instrumental in determining emergent themes and salient points of HOF from the instructors' point of view. The following interview categories provided a framework to interpret the results:

- Goals for participating in HOF, and elements that helped or hindered being able to achieve goals and objectives of HOF.
- Favorite and least favorite HOF activities.
- Challenges of being a HOF instructor.
- Recommendations for future HOF instructors.
- Significant experiences with HOF.
- Judge program success.
- Possess sufficient resources and support to conduct HOF activities.
- Recommended changes to improve HOF and how to make changes.
- Other comments about HOF.

Qualitative Results

Open-ended interviews with 16 HOF instructors provided insights in relation to motivations of those who participated. While not conducted in a statistically robust fashion the results were significant to those who might consider instituting programs such as HOF. What key characteristics would define a suitable instructor to assist teachers in their HOF programs?

When asked why they had become HOF instructors, the 16 individuals gave answers which included love of teaching, it was part of their job with MFWP, fishing was personally important to them, and they wanted to teach students how to fish and appreciate the outdoors. The goals and objectives for their programs were directly related to connecting students with their local environment, and to give them alternative outdoor activities to indoor activities. Instructors wanted to provide fishing experiences to spark a lifelong interest in the outdoors, and to build self confidence.

Smiles on students' faces, enthusiasm to do more and learn more, parental involvement, and repeated interaction with students and teachers were attributes the instructors liked best about HOF. They also liked the consistency of the basic program components, but felt it was important to have flexibility to choose other activities, if time were available.

Features they liked least were unengaged teachers who did not do their part to have fishing equipment prepared, and not enough adult supervision for the fishing day. Other negative aspects of their experiences were inadequate time to effectively complete the HOF activities, time spent traveling, especially, in

winter, and extra miles on personal car. Also, the amount of preparation time necessary to be organized for classroom activities, and having to cut HOF activities due to budget limitations.

There were 33 different HOF activities conducted by 16 instructors during 2005-06. Fish identification, fish dissection, casting, and spring fishing were done by more instructors than any other HOF activities. The challenges facing instructors included: time to get everything done, trying to adapt teaching methods for different teachers and grade levels, and to have each student catch a fish. For those instructors, who were in the same classroom several times during the year, being familiar with the different program topic areas was a challenge. Experienced instructors recommended that future instructors would benefit by observing, assisting, and working closely with experienced instructors; communicating with school administrators and staff; and giving the outdoor HOF experience some priority over other educational activities.

Over the years, instructors had diverse experiences with teachers and students that stuck in their memories. Some of these were thank you notes received, good insightful questions from students, looks of satisfaction on a students' face when their first fish was caught, phone calls of appreciation and support from parents. Instructors related the pleasure they felt when a student approached them away from the school environment, and recalled the meaningful experiences they had in the HOF program. Gratifying feedback, enthusiasm for the program, repeat invitations from teachers, community

support, and new schools involved were aspects of how instructors judged program success.

Nineteen percent of the instructors felt they had the necessary time and resources to conduct their programs. However, 79% expressed the need for more time and money to adequately do their job. The instructors were supported by businesses, organizations, and individuals in their HOF related activities. Community assistance came from students' parents, school administrators and office staff, Plum Creek Foundation, Walleyes Unlimited, Bureau of Land Management, Missouri River Flyfishers, Snappy's Sporting Goods Store, Sportsman Ski Haus, First Interstate Bank, Albertson's, American Legion, Custer Rod and Gun Club, Pike Masters, Wildlife Unlimited, Optimist Club, Federation of Fly Fishermen, and law enforcement, fisheries, and wildlife staff from MFWP.

Suggestions from instructors on how to improve the HOF program could be separated into two main categories: (1) existing program development and implementation and; (2) future program expansion. Improvements needed included: development of consistent program standards and outcomes, uniform program materials, name badges, and an instructor's manual with pre-study and post-study activities for teachers to follow in preparation for and follow-up to HOF instructors' activities. Suggestions for "fine tuning" the program included sharing between teachers and instructors what worked well and what did not and, then, adjusting the program accordingly. It was considered important to preserve the program's flexibility and ability to adjust to lessons learned. Having more working

time with teachers during scheduled fall workshops to discuss needed adjustments to the program.

Continued expansion of HOF into other schools was suggested by several instructors. Mechanisms suggested included providing targeted publicity to increase awareness of HOF; more time and funding devoted to support new instructors and maintain momentum of the program; have one person designated in each MFWP region to work with HOF instructors in a supportive role and have responsibility for program expansion.

At the conclusion of the interviews, instructors were invited to make any final comments about HOF. These comments provided anecdotal evidence to enhance instructors' ideas relative to continued improvements in HOF. Key comments included the following:

- Pleased that the theme for the program was changed to "HOF", instead of "HOF NOD".
- The program would benefit with a more standardized "brand" supported with an identifying logo.
- Exchange of experiences and ideas with teachers and instructors in other states with similar programs.
- More emphasis on ethics of fishing and outdoor recreation.
- Continued, or enhanced program support, through both increased funding and more qualified instructors is warranted.

CHAPTER 6: DISCUSSION

This chapter is divided into two sections. The first section discusses the quantitative data used to assess students' outcomes - attitude, intended behavior, skill, and knowledge, and examines the relationship between frequency of outdoor experiences, and how increased knowledge affected student outcomes. The second section discusses the evaluation approach and process used in this study, what was learned, and - with the broader evaluation criteria in mind - how the process could have generalized application.

Student Outcomes

If, public opportunities to learn about responsible use and stewardship of Montana's fisheries, waters, and other aquatic resources are important to MFWP (MFWP Strategic Plans, 2006), then, understanding whether or not the HOF program was having significant affects on student outcomes becomes essential. Summative evaluation is vital because MFWP has invested significant time, effort, and financial resources into HOF over the past 10 years. The program has reached hundreds of teachers and thousands of students in an attempt to integrate education relative to aquatic ecosystems and their conservation into school curricula while promoting the sport of fishing among both young people and adults (MFWP Strategic Plans, 2006). The objective was simple - was the program effective?

The logic model for HOF (Figure 12, p. 69) illustrates the relationships between and among the program inputs, outputs, and outcomes. This illustration provides a good starting point for reflection upon considering whether program

activities had positive effects on achieving desired outcomes for participating students.

Once the desirable outcomes - knowledge, skills, attitudes, and intended behaviors - were determined by primary stakeholders, it was important to consider the theoretical underpinnings of student learning and behavior related to fish, aquatic habitats, and stewardship of natural resources. Hungerford and Volk (1990) initially thought responsible environmental behavior change was a simple linear relationship - begin with knowledge, build awareness and appreciation, leading to the assumption that a person so equipped would want to act responsibly. Hines et al. (1986/87) broadened this linear relationship construct by considering the personal and situational domains that - when combined with knowledge, attitudes, and skills gained - would affect the intention to act and eventually influence responsible environmental behavior.

Fishbein and Ajzen's (1980) theory of reasoned action added two basic, but essential determinants into the theoretical framework for this study. The first, which was personal in nature, were attitudes - influenced by aspects of individuals' past experiences - toward responsible environmental behavior. The second, the social pressures to perform or not perform desired responsible environmental behavior was influenced by whether the action was evaluated positively, and if individuals' believed that significant others thought they should perform the responsible environmental behavior.

Among first assumptions made by primary stakeholders when deciding upon outcomes to measure, was that HOF affected students' attitudes about and

intended behaviors toward fishing, aquatic habitats, and stewardship of these resources. Analysis of the answers to the 39 survey questions (Appendix H, p. 258) demonstrated statistically (Table 12, pp. 103 and 104), that there were significant differences between the two groups of students (experimental and control) for knowledge and skill outcomes but, little difference was found for attitudes and intended behaviors, especially for intended behaviors. For the most part, HOF did not significantly affect students' attitudes and intended behaviors (Table 12, pp. 101 and 102).

These findings were noteworthy and provoked reexamination of HOF's goals and objectives relative to student outcomes. Goals were to introduce students to fish and aquatic resources and, promote fishing and outdoor recreation as a positive activity. Objectives were to help students develop awareness and appreciation for fish and aquatic resources in Montana, develop interest in fishing and outdoor recreation and, to teach safe and responsible outdoor skills. The pertinent data focused primarily on knowledge and skill outcomes (Table 12, pp. 103 and 104).

No statistically significant results were found for attitude and intended behavior outcomes in positive directions when correlating experimental group paired samples for pre-post surveys and post-extended post surveys (Tables 14 and 15, pp. 112 - 115). However, knowledge and skill outcomes were typically affected in a positive direction and were statistically significant especially for the pre-post survey (Table 16 and 17, pp. 117 - 121). The results of the post-extended post surveys with a smaller sample of students showed the effects of

HOF on knowledge and skill outcomes were not significant over time. It appeared that these outcomes were diminished, but had the students reported loss of knowledge or skill, the results would have been statistically significant and negative directions of change would have been evident. Instead, the measure was not statistically significant. I interpreted that to mean that there was no change in the measured outcome from post-survey to extended post-survey. This indicated that students did not report they knew more, or that their skills had improved. Evidence of no change suggested students felt they had maintained the same knowledge and skill levels over the 12 - 14 week period. These results were encouraging.

Measuring evidence of change for student outcomes as a result of HOF was insightful, but provided little understanding as to what components of the program helped make the significant effect. Lieberman and Hoody (1998) demonstrated that learning outside could improve student achievement levels, reduced disciplinary problems, and increased engagement and enthusiasm for learning. These results offered supporting evidence for the required inclusion of HOF outdoor experiences.

Teachers were required to take their students outside for at least one HOF activity, this (coupled with the national movement to encourage youth to explore the outdoors in order to build a connection to nature (Louv, 2005)) made the first research question applicable. That question was, "did the frequency of outdoor experience(s) have significant effects on students' attitudes, intended stewardship behaviors, skills, and knowledge?

Getting students out of the classroom and outdoors through the HOF program made a significant difference relative to students' attitude and intended behavior outcomes, but changed in negative directions (Tables 18 and 19, p. 123), changes were only found on the upper ends of measurement scales. These findings were anticipated due to previous results relative to the correlated paired sample pre-post results for the same outcomes (Tables 14 and 15, pp. 112 and 114).

Conversely, "getting outside" at least once made a significant difference and changed in positive directions for some student knowledge and skill outcomes, but even more significant for most knowledge and skill outcomes was getting outdoors "2 - 3 times" as opposed to only once (Tables 20 and 21, pp. 125 and 127).

The second research hypothesis was that, when results showed that HOF students' knowledge increased significantly (Table 17, pp. 120 and 121), it would be accompanied with significant increases in skills, attitudes and intended behaviors. Because students' attitude and intended behavior outcomes had previously been shown to be not statistically significant, and changed in negative directions (Tables 14 and 15, pp. 112 - 115) they were not used to test the hypothesis. For that reason, only skill outcomes (Table 16, p. 117) were considered in the analysis when controlling for increased knowledge to detect evidence of significance and positive change between pre- and post-surveys. The results demonstrated significance and positive association between some knowledge and skill outcomes for the HOF program (Table 22, pp. 129 and 130).

For example, if a student knew "some" or "a lot" about the features that make good habitat for fish then they also knew how to clean up the area where they fished "very well" or "pretty well".

The strength in these analyses was the ability to determine which outcomes were being most significantly affected by HOF, and how the level of significance and associated direction changed over time for students. The ability to determine whether frequencies of outdoor experiences were significantly affecting positive change was exhilarating to teachers, instructors, and sponsors whose time and resources went into providing these experiences for involved students.

Evaluation Approach and Process

A practical user-focused approach called utilization-focused evaluation (Patton, 1997) was used successfully for this evaluation. The evaluation plan (Table 8, pp. 71 and 72) defined the process of evaluation and provided a framework with defined activities targeted on outputs and outcomes to standardize each phase of the evaluation.

The teachers, instructors, program coordinator, and I collaboratively developed what we considered useful instruments to measure the program both quantitatively and qualitatively. The mixed methodologies enhanced abilities to interpret the results of the student surveys in particular. The teacher on-line survey provided the teachers perspective on the program and what they thought their students gained from participating. The instructors expressed their interest and enjoyment in the program and where they thought improvement could be

made. I felt that the instructors in particular enjoyed being able to provide feedback on the program in an anonymous format. I was encouraged to observe the time and effort the teachers, students, and instructors put into this evaluation. In my opinion, this was, to some degree, an expression of how important they considered the program to be - largely as the result of relationships forged between instructors, teachers, and students.

The user-focused approach is personal and situational which allowed me to facilitate the evaluation process with consideration for increased application and utility of evaluation findings and implementation of recommendations from beginning to end. If given the charge to carry out such an evaluation again, knowing what I know now, I would use the same approach but make some improvements in the process.

As a part of my doctoral fellowship with National Science Foundation's CLTW project, I had the opportunity to apprentice as an evaluation team member, from August 2004 through November 2006, under evaluation coordinator, Dr. Joan LaFrance[23]. This valuable educational experience taught me many aspects of program evaluation practice in science and math education. However, one of the most important lessons I learned was to take time at the end of any evaluation to reflect on the process used, and determine how it could be improved.

Upon reflection and under the guidance of the Program Evaluation Standards (1994), I would make improvements under the following attributes of

[23] Dr. Joan LaFrance, a professional evaluator from Mekinak Consulting served as the evaluation coordinator for CLTW under the direction of Dr. Elizabeth Swanson, the primary investigator at Montana State University for the National Science Foundation supported university consortium.

evaluation: (1) utility standards which guide the process to be informative, timely, and influential; (2) feasibility standards which recognize that practical procedures are used when planning the evaluation; and (3) accuracy standards which consider that the evaluation is comprehensive and produces sound information.

First, I would spend more organized time with the primary stakeholders to conduct a formal situational analysis, to examine the context in which the program exists and that the evaluation should to take into account. Second, I would actively involve more key stakeholders (i. e., MFWP conservation education bureau chief, MFWP human dimensions specialist, elementary school administrator, school psychologist) to determine the major foci for the evaluation, and attain agreement, or at least, understanding of the perspectives and rationale used to interpret the evaluation findings. Third, I would assure that all high priority questions were addressed by conducting several iterations to develop clear, concise, and reliable instruments. And, perhaps foremost, I would assure scheduling enough time for those developing and piloting the instruments, so the process is less rushed. Fourth, I would make certain enough time is scheduled to develop methods that are more appropriate to questions asked. For instance, perhaps the inclusion of field experience observations and small group discussions centered on a few specific questions would have been better methods to evaluate students' attitude and intended behavior outcomes. Fifth, I would conduct the pre-survey before the program begins, and with a randomly selected sample - if appropriate and possible.

Each conservation education program or set of programs are conducted under specific goals and objectives. But, each is probably focused on similar outcomes - changes in knowledge, skills, attitudes and behaviors. With the broader need for evaluation becoming ever more evident in the conservation education arena, this evaluation approach and process with improvements suggested above, has generalized application. The personal and situational component for individual programs to be evaluated lies in designing the instruments for application. However, a standardized format and protocol could be followed to develop the program specific instruments.

Recent technological innovations have made the collection of testing or survey data easier. For example, Hyper Interactive Teaching Technology Company (2007) has developed a Classroom Response System that enables instructors to pose questions and immediately collect individual responses from an entire class. These handheld devices and accompanying presentation software can be used in most learning environments to collect data directly from program participants who remotely select answers which are, then, stored in a data base. The program teachers and/or instructors could be trained to implement these tools to shorten the time needed to conduct surveys. Data collection in such format can be immediately subjected to programmed statistical analyses.

If conservation education programs were evaluated using more standardized procedures, results from various programs would be more easily compared quantitatively and qualitatively. Also, the evaluation process would not

be such a daunting undertaking (e.g., the process described herein), and the results could be used to answer the specific questions of program users, and to more quickly and efficiently make program adjustments for improvement.

CHAPTER 7: CONCLUSION

The vision for conservation education (Association of Fish & Wildlife Agencies, 2005) in the 21st century is intended to unify and strengthen formal and nonformal educational efforts to progress beyond the recruitment and retention of citizens to merely participate in outdoor recreation endeavors. To gain best results it will be necessary to design programs that accomplish more than just getting students into the out-of-doors. Such programs will require informing and involving citizens to understand the value of fish and wildlife resources as a public trust, appreciate conservation and management strategies that sustain desired quality of life, understand the need for active participation in stewardship and support of natural resources (Association of Fish & Wildlife Agencies, 2005). This vision is admirable. To assess whether it becomes a reality will require sustainable application of participatory evaluation processes with involved stakeholders to effectively measure outcomes and continuously improve programs for all participants.

Evaluating the effectiveness of the HOF program was accomplished by systematically measuring student outcomes. Concurrently, teachers were surveyed and instructors interviewed to reveal emergent themes and categories. Multiple methods of data collection and analysis were used in complementary fashion to study the same program from different points of view. Each of these components contributed to the utility and relevance of the evaluation.

The evaluation process revealed some surprising findings that could be useful in future program improvements. For example, results for attitude and

intended behavior outcomes indicated there was no significant difference between students who had participated in the program and those who did not. There were exceptions in the responses to questions about how students felt about learning science both in the classroom and outdoors, whether they thought it was important to use water carefully, and how their actions affected plants, fish, and wildlife. These results of significant difference did not continue to show positive change on the extended post-survey. The reason was most likely due to these outcomes not being directly addressed by program instructors or emphasized in the activities during the academic year.

The post-survey results revealed that HOF students did not want to learn any more about fish and water in Montana than students who had not participated in HOF. This response was not expected, however, the extended post-survey findings indicated just the opposite response.

There may be two reasons for this unexpected result. First, the post-survey was conducted at the end of the school year when the students were preoccupied with thoughts of getting out of school for summer vacation, and/or because they were familiar with and had already answered the question on the pre-survey and had less enthusiasm when answering it again. The second reason may have been that the HOF students who participate in the extended post-survey went fishing over the summer months, and their experience(s) encouraged them to want to learn more.

Extended post-survey results showed that positive effects and significant differences were mostly retained for knowledge and skill outcomes. Interestingly,

more skill outcomes retained their positive effects for HOF students, than knowledge outcomes which indicated less change in students' self-reported knowledge from post-survey to extended post-survey.

The correlated paired sample findings between pre-post survey data and post-extended post survey data for HOF students provided detail about the significant differences for all outcomes. The findings for attitude and intended behavior outcomes showed no significant difference because, as the data revealed, the HOF program was not designed to affect these outcomes even though teachers and instructors thought these outcomes were being covered implicitly in their teachings. On the other hand, significant differences were predominately in positive directions for skill and knowledge outcomes. This is because the HOF activities were designed to meet these outcomes, as outlined by the program goals and objectives. The extended survey findings did not show these continued results. Perhaps this was because the students had not done anything that made them want to change their responses, or there selected answer was at the top of the scale.

The frequency of more than one outdoor field experience did have significant effects in a positive direction for improving knowledge and skill outcomes for HOF students between the pre- and post-surveys. This was especially evident for the range of 2 - 3 outdoor experiences, which were highly significant ($p \leq 0.001$) with positive correlations. This provided supporting evidence for the program requirement that teachers arrange at least one outdoor field trip as part of their HOF program during the school year - and that, clearly,

several trips were superior to a single trip. The evaluation process yielded data about assumptions being made by program deliverers some of which ran counter to expectations.

Reflecting on the responsible environmental behavior model (Hines et al., 1986/87) and Hungerford and Volk's (1990) entry-level, ownership, and empowerment variables (p. 37) for responsible environmental behaviors indicates that HOF is focused on entry-level variables. This implies that knowledge about fish, aquatic habitats, and associated natural resources, and skills to use when fishing and recreating in the outdoors have been gained through participation in HOF. If responsible conservation and stewardship behaviors are desired outcomes for MFWP, then ownership (personal investment) and empowerment (sense that positive environmental changes can be made) variables will need to be considered in the development of future programming. It is important that situational factors - social pressures, economic constraints, opportunities - are realized due to the influences they have on how individuals choose to act.

This study contributed descriptive and analytical information that can be extended to enhance evaluation assessment tools and methods, and to improve the effectiveness of conservation education programs. The study design and methodology will need to be replicated with other state and national conservation education programs to be able to generalize the specific findings, and to increase external reliability and validity.

The quantitative and qualitative findings of this study may be used to enhance professional development training conducted for teachers and instructors who want to include similar place-based conservation education programs coupled with field experiences for the purpose of increasing students' knowledge, skills, attitudes, and responsible stewardship behaviors for sustainable conservation and management of natural resources.

This study has demonstrated that educational activities of a program such as HOF can significantly affect and positively change students' knowledge and skill outcomes defined by program goals and objectives as identified by the sponsoring agency or organization. If MFWP, the sponsoring agency in this case, wants to affect student attitudes and intended behavioral outcomes, then program administrators will need to rewrite program goals and objectives to meet all desired outcomes. Likewise, if these outcomes are focused on fostering responsible use and stewardship of natural resources, then, the word "conservation" ought to be expressed in the goals and objectives. Also, suggestions and recommendations made by participating teachers and instructors (Appendix E, p. 231 and Appendix F, p. 242) should be considered and used in program modifications. Recommendations such as, field experiences that include adopting and caring for a local fishing access site, or helping to restore a stream reach or wetland area ought to be incorporated as future activities if supporting resources (i.e., financial, personnel, local access to field sites) are available. Finally, the program logic model should be revisited to

determine how goals and objectives can be redefined to set the course to achieve all desired outcomes.

The user-oriented evaluation approach and methods used are practical and replicable. The systematic methodology and implementation strategies contributed quantitative and qualitative results for program managers to make informed program improvements. These methods were designed to be used on a reoccurring basis to determine trends in desired student outcomes over the life of the program. It was beneficial to combine quantitative methodology with qualitative to triangulate the objective results with the subjective interpretations.

The participatory approach required significant funding to support time and effort necessary to discover, measure, and analyze program outcomes specific to the study area and the evaluation plan. It was imperative to work with stakeholders to understand the diverse program components and how the implementation system worked. Necessary time and effort must be provided to determine significant intentions for evaluation methodology and to develop meaningful instruments to measure outcomes. Both components - more time to conduct situational analysis of overall program, and to involve a wider array of stakeholders in the development of evaluation foci - should be considered and carried out to improve the evaluation process.

The evaluation process empirically measured the level of program effectiveness based on desired student outcomes, demonstrated values the program had for teachers, instructors, the program coordinator, and provided an opportunity for stakeholders to suggest improvements. Common values

coalesced around benefits that students received through experiential learning, support and involvement of parents and community, and high quality instruction and support materials provided by the program to help meet educational expectations framed by academic content standards. The value of the evaluation process to all intended users was to objectively calculate the program's merit, and consider where and how improvements can be made.

The benefits of systematically evaluating program outcomes through participatory evaluation from multiple dimensions was realized when stakeholders helped formulate, and then, accepted the overall purpose of the evaluation. Working collaboratively helped to assure instruments were developed, tested, and administered as efficiently and effectively as possible. The value of working collectively enhanced development of positive relationships between the stakeholders and me, and had substantial impact on resulting high response rates.

Conclusions and recommendations from this study provide guidance to help MFWP make decisions relative to their program. More important, the processes developed and the findings provide a model for other conservation agencies and organizations to use in evaluating the effectiveness of their conservation education programs.

CHAPTER 8: RECOMMENDATIONS FOR FURTHER RESEARCH

Siemer and Knuth (2001) recommended fisheries agencies should determine the extent to which their conservation education program goals and objectives "focus on developing youth who become responsible anglers and aquatic resource stewards" (p. 29). By applying utilization-focused evaluation (Patton, 1997) this study did that for MFWP's HOF program, and established that only knowledge and skill outcomes associated with responsible environmental entry-level variables (Hungerford and Volk, 1990) were acquired by participating students. Future research should be conducted using standardized quantitative and qualitative survey instrument formats and protocol, where possible, to assess common entry-level, ownership-level, and empowerment-level variables and associated outcomes to evaluate the effectiveness of conservation education programs.

I built an evaluation foundation and initial framework to assess the effectiveness of place-based conservation education programs in classrooms and the outdoors. From this experience, I learned lessons about research methodology and developed ideas to further develop evaluation studies of this kind. I recommend that such future studies replicate the utilization-focused approach (Patton, 1997), but give more attention and time to elicit salient beliefs and questions for survey instrument development with a relevant suite of primary stakeholders.

More appropriate measures for attitude and intended behavior outcomes should be obtained through observational field work or small group discussions. I

recommend that educational program staff be encouraged to gain experience in the process of evaluation research (Fedler, 2001), and routinely participate in applied research using quantitative and qualitative techniques (observations, small group discussions) to evaluate the effectiveness of outdoor experiences on students' attitudes and behaviors.

Similar to (Zint et al., 2002), I believe it is challenging to design evaluation that determines how conservation education programs affect student outcomes especially responsible environmental behaviors. The antecedent to this challenge is clearly defining entry-level, ownership, and empowerment variables associated with fulfillment of program goals and objectives focused on developing youth who become responsible stewards (Siemer and Knuth, 2001).

User-focused participatory evaluation should continue to help guide and improve conservation education efforts on state and national levels. The evaluation process can be improved by investing more time, with some more cost to benefit the quality of the results, but in any case below the point of diminishing return. To replicate the evaluation approach and process given the investment of more time to conduct a thorough situational analysis, involve more stakeholders in development of evaluation foci, to develop and pilot instruments, and to ensure the pre-survey is administrated prior to any treatment will increase costs but the benefits to the overall quality of the evaluation and results will be substantial. How to craft the form of the response function that elevates value of outcomes from this kind of evaluation for the costs of inputs in time, impacts on program participants, and dollars is a remaining challenge.

Effective place-based conservation education begins with introducing participants to associated natural resources in local environments. However, the course of programmatic action, based on this study, must do more to significantly affect attitude and behavior outcomes for healthier and happier youth today and for generations to come. Youth who understand and value their direct connection to nature, who can recognize and make meaningful contributions to conservation by their participation as stewards in places where they live. This is the task of conservation education in the 21st century and the reason why user-oriented participatory evaluation must be an integral and sustained component of every conservation education program. "When evaluation becomes integral to the program, its costs aren't an add-on" (Patton, 1997 p. 93).

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APPENDIXES

Appendix A

- List of Montana Communities with HOF Program in Schools

Table 24.
The Montana communities with HOF school programs in 2005-06.

MFWP Region	Montana Community	Number of Schools
1	Bigfork	2
	Charlo	1
	Columbia Falls	2
	Creston	2
	Dayton	1
	Eureka	1
	Hungry Horse	1
	Kalispell	16
	Kila	1
	Lakeside	1
	Marion	1
	McCormick	1
	Pablo	1
	Plains	1
	Polson	3
	Ronan	1
	Thompson Falls	1
	Trego	1
	Trout Creek	1
	Whitefish	3
	Yaak	2
3	Helena	4
4	Belt	1
	Bynum	1
	Centerville	1
	Choteau	1
	Dupuyer	1
	Geraldine	1
	Great Falls	2
	Fairfield	2
	Highwood	1
	Sand Coulee	1
	Stanford	1
	Sun River	1
	White Sulphur Springs	1
5	Billings	6
6	Havre	1
7	Broadus	1

Appendix B

- Pre-Survey Directions for HOF Students
- Pre-survey Instrument for HOF Students
- Student Code List for each Teacher and Classroom

Howdy!

This is a survey for Montana students like you who are participating with your teacher in the Hooked on Fishing Program this year in school.

The purpose of this survey is to find some answers from all the HOF students who, like you, are involved in the program. The questions asked in this survey will focus on the skills, behaviors, knowledge, and attitudes that you have RIGHT NOW.

The survey should take about 15 to 20 minutes to complete. Your survey will be completely anonymous – which means your name will not be used or known to anyone at any time.

Directions for the students

•Spell the words as best you can, you may print or write in cursive.
•(X) mark, or (√) each box with the answer which is the best choice for you.
•Respond honestly, there are no right or wrong answers.
•If you have a question, at any time, please ask.

- **Grades 3 – 5: I will read each question as you read along, look at the answer selections, and make one selection for each question.**
- **Grades 6 – 8: Please read each question on your own.**

Thank you for taking time to answer the questions. I appreciate it!

Hooked ON FISHING

Montana Fish, Wildlife & Parks

Pre-Student Survey -- Hooked on Fishing in Montana

Hooked ON FISHING

Teacher:_____

Student Pre-Survey Code:_____

Today's Date:_____

SECTION ONE: Please describe a few things about yourself.

1. **What grade are you in this year?** ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ 7th ☐ 8th

2. **Are you:** ☐ a girl? **OR** ☐ a boy?

3. **How old are you?** _____

4. **What is your favorite fish found in Montana waters?** _____

5. **What is your favorite subject in school?** _____

SECTION TWO: Please think about what your feelings are about fish, water habitats in Montana, and outdoor activities when you answer the following questions.

6. **On a nice day, would you rather be inside doing something like watching TV or playing outside?**
   ☐inside ☐outside ☐ I am not sure

7. **How much do you like outdoor activities like hiking, camping, hunting, fishing etc.?**
   ☐very much ☐sort of ☐not at all

8. **When I think about fish, I think they are:**
   ☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

9. When I think about outdoor activities, I think they are:

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

10. How interested are you in learning <u>MORE</u> about Montana fish and the waters where they live?

☐very interested ☐sort of interested ☐not very interested ☐do not care

11. How do you feel about learning science in your classroom?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

12. How do you feel about learning science in your classroom AND in the outdoors?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

13. Choose the sentence below which <u>BEST</u> describes how you <u>CARE</u> about Montana fish and where they live?

☐I care a lot ☐I care some ☐I don't care at all

14. Choose the sentence below which <u>BEST</u> describes how you <u>FEEL</u> about fishing:

☐ I love to fish.
☐ Fishing is ok.
☐ I will go fishing, but I don't like it very much.
☐ I would rather not go fishing.
☐ I am not sure at this time.

15. Please mark one box for each item below to show HOW IMPORTANT each is to you personally.

a. Visit and explore places such as creeks, ponds, lakes, and wetlands.

☐Very important ☐Somewhat important ☐Not Important

b. Help take care of places in your local area where plants, fish, and wildlife live.

☐Very important ☐Somewhat important ☐Not Important

Question 15 Continued: Please mark one box for each item below to show HOW IMPORTANT each is to you personally.

c. Think about how things you do might affect plants, fish and wildlife that live in or near water.
☐Very important ☐Somewhat important ☐Not Important

d. Use water carefully.
☐Very important ☐Somewhat important ☐Not Important

e. Help make sure that people in the future have clean water to drink.
☐Very important ☐Somewhat important ☐Not Important

f. Help make sure that people in the future have places to enjoy the outdoors.
☐Very important ☐Somewhat important ☐Not Important

SECTION THREE: Think about your BEHAVIORS, and what you think YOU might do in the future.

16. In your lifetime, have you EVER gone fishing?
☐**Yes** (go to question #17) ☐**No** (go to question #21)

17. If you answered "yes" above, how many times in the past YEAR did you go fishing?
☐6 or more ☐4 or 5 ☐2 to 3 ☐1 ☐not at all

18. Do you know HOW to fish?
☐Yes ☐No (go to question #21)

19. Who do you fish with? *Pick everyone you fish with.*
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives

☐other people (like your teacher)

20. Who taught you to fish? ***Pick everyone who taught you.***

☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives

☐other people (like your teacher)

21. If you answered "no" above, do you think you will EVER want to go fishing, and/or fish in your lifetime?

☐Yes ☐No

22. Think about when you learned a NEW hobby, like fishing, photography, horseback riding, etc. Which of the sentences below BEST describes how you <u>like</u> to learn? ***You may pick as many sentences as you want.***

a) ☐ I like to use my hands when I learn new hobby.

b) ☐ I like it when someone helps me learn a new activity.

c) ☐ I like to try and figure it out myself, without help from someone else.

d) ☐ I like to read about something, and then try it myself.

e) ☐ Other way(s) I like learning: (*write "other way(s)" on the line(s) below):*

_____

_____

<u>SECTION FOUR: Please think about yourself, and consider how well you KNOW HOW to do the different things listed below.</u>

RIGHT NOW, *how well do you KNOW HOW to do each of these things?*

23. Choosing where to go fishing

☐very well ☐pretty well ☐not very well **☐don't know how at all**

24. Reading the fishing laws and knowing what they are BEFORE you go fishing

☐very well ☐pretty well ☐not very well ☐don't know how at all

25. Handling a fish you have caught

☐very well ☐pretty well ☐not very well ☐don't know how at all

26. Releasing a fish you decide not to keep

☐very well ☐pretty well ☐not very well ☐don't know how at all

27. Cleaning the fish you catch

☐very well ☐pretty well ☐not very well ☐don't know how at all

28. Identifying different kinds of fish

☐very well ☐pretty well ☐not very well ☐don't know how at all

29. Using different kinds of fishing equipment

☐very well ☐pretty well ☐not very well ☐don't know how at all

30. Taking care of your fishing equipment

☐very well ☐pretty well ☐not very well ☐don't know how at all

31. Casting your fishing line

☐very well ☐pretty well ☐not very well ☐don't know how at all

32. Tying knots in your fishing line

☐very well ☐pretty well ☐not very well ☐don't know how at all

33. Ice fishing

☐very well ☐pretty well ☐not very well **☐don't know how at all**

34. Cleaning up the area where you fish

☐very well ☐pretty well ☐not very well **☐don't know how at all**

35. Following the fishing laws WHEN fishing

☐very well ☐pretty well ☐not very well **☐don't know how at all**

36. Being safe around and in the water

☐very well ☐pretty well ☐not very well **☐don't know how at all**

SECTION FIVE: Please describe how MUCH you think you KNOW about the fish and fishing in Montana.

RIGHT NOW, how much do you THINK you KNOW about the following things listed below?

37. Montana fishing laws.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

38. The different native and not native fish in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

39. The different names of fish found in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

40. The things that make good habitat for fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

41. The importance of clean water to people, plants, and animals.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

42. The water in Montana and where it is found.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

43. The different kinds of bugs and insects that live in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

44. The body parts of a fish and what they do for the fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

45. The jobs that work with fish and wildlife in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

46. The jobs that work with science and the natural world.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

Thank you very much!!

☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺☺

Hooked ON FISHING 

Student Pre-, Post, and Extended Surveys

Teacher _____

Student Code	Last Name, First Initial
1	
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Appendix C

- Post-Survey Instrument for HOF Students
- Letter to Teachers of NON HOF Students
- Parental Letter and Consent Form for NON HOF Students
- Post-Survey Directions & Ascent Form for NON HOF Students
- Post-survey Instrument for NON HOF Students

Post-Student Survey -- Hooked on Fishing in Montana

Hooked ON FISHING 

Teacher:_____

Student Post-Survey Code:_____

Today's Date:_____

SECTION ONE: Please describe a few things about yourself.

1. **What grade are you in this year?** ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ 7th ☐ 8th

2. **Are you:** ☐ a girl? **OR** ☐ a boy?

3. **How old are you?** _____

4. **How many times did your class go outside for Hooked on Fishing activities this school year?**
   ☐6 or more ☐4 or 5 ☐2 to 3 ☐1 ☐not at all

5. **What is your favorite Hooked on Fishing activity?** _____

SECTION TWO: What are your feelings NOW about fish, water habitats in Montana, and outdoor activities.

6. **On a nice day, would you rather be inside doing something like watching TV or playing outside?**
   ☐inside ☐outside ☐ I am not sure

7. **How much do you like outdoor activities like hiking, camping, hunting, fishing etc.?**
   ☐very much ☐sort of ☐not at all

8. When you think about fish, you think they are:

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

9. When you think about outdoor activities, you think they are:

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

10. How interested are you in learning <u>MORE</u> about Montana fish and the waters where they live?

☐very interested ☐sort of interested ☐not very interested ☐do not care

11. How do you feel about learning science in your classroom?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

12. How do you feel about learning science in your classroom <u>AND</u> in the outdoors?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

13. Choose the sentence below which <u>BEST</u> describes how you <u>CARE</u> about Montana fish and where they live?

☐I care a lot ☐I care some ☐I don't care at all

14. Choose the sentence below which <u>BEST</u> describes how you <u>FEEL</u> about fishing:

☐ I love to fish.
☐ Fishing is ok.
☐ I will go fishing, but I don't like it very much.
☐ I would rather not go fishing.
☐ I am not sure at this time.

15. HOW IMPORTANT is each of the following activities to you personally. Please mark one box for each item below.

a. Visiting and exploring places such as creeks, ponds, lakes, and wetlands.

☐Very important ☐Somewhat important ☐Not Important

b. Helping to take care of places in your local area where plants, fish, and wildlife live.

☐Very important ☐Somewhat important ☐Not Important

Question 15 Continued: HOW IMPORTANT is each to you personally.

c. **Thinking about how your outdoor activities might affect plants, fish and wildlife that live in or near water.**
☐Very important ☐Somewhat important ☐Not Important

d. **Using water carefully.**
☐Very important ☐Somewhat important ☐Not Important

e. **Helping to make sure that people in the future have clean water to drink.**
☐Very important ☐Somewhat important ☐Not Important

f. **Helping to make sure that people in the future have places to enjoy the outdoors.**
☐Very important ☐Somewhat important ☐Not Important

SECTION THREE: Think about your BEHAVIORS, and what you think YOU might do in the future.

16. How many times during the past YEAR did you go fishing?
☐6 or more ☐4 or 5 ☐2 to 3 ☐1 ☐not at all

17. Who taught you to fish? ***Pick everyone you taught you.***
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives
☐other people (like your teacher)

18. Who do you fish with? ***Pick everyone you fish with.***
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives
☐other people (like your teacher)

19. Do you think you will continue to fish in the future?
☐ Yes ☐ No ☐ Maybe

SECTION FOUR: Right NOW, how well do you KNOW HOW to do the things listed below.

20. Picking a place to go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

21. Reading the fishing laws and knowing what they are BEFORE you go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

22. Carefully, handling a fish you have caught.

☐very well ☐pretty well ☐not very well ☐don't know how at all

23. Carefully, releasing a fish you decide not to keep.

☐very well ☐pretty well ☐not very well ☐don't know how at all

24. Carefully, cleaning (or gutting) the fish you catch.

☐very well ☐pretty well ☐not very well ☐don't know how at all

25. Correctly, identifying different kinds of fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

26. Using different kinds of fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

27. Taking care of your fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

28. Casting your fishing line into the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

29. Tying good fishing knots in your fishing line.

☐very well ☐pretty well ☐not very well ☐don't know how at all

30. Ice fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

31. Cleaning up the area where you fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

32. Following the fishing laws WHEN fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

33. Being safe around and in the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

SECTION FIVE: Right NOW, how MUCH do you think you KNOW about the fish and fishing in Montana.

34. Montana fishing laws.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

35. The different native and not (non) native fish in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

36. The different names of fish found in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

37. The things that make good habitat for fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

38. The importance of clean water to people, plants, and animals.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

39. The water in Montana and where it is found.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

40. The different kinds of bugs and insects that live in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

41. The body parts of a fish and what they do for the fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

42. The jobs that people have that work with fish and wildlife in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

43. The jobs that people have that work with science and the natural world.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

Thank you very much!! ☺

April 28, 2006

Classroom Teacher:

Lisa Flowers is a doctoral student in the College of Forestry and Conservation at the University of Montana. She is a certified secondary science teacher, and has taught field-based science programs for students and teachers for the past twelve years. Lisa is currently working on a research project sponsored by the Boone and Crockett Club, Montana Fish, Wildlife & Parks, the Welder Wildlife Foundation, and the Center for Learning & Teaching in the West. The purpose of her study is to evaluate the effectiveness of a conservation education program by assessing student knowledge, attitudes, skill, and intended stewardship behavior. She is specifically evaluating Montana Fish, Wildlife and Parks' *Hooked on Fishing* (HOF) education program.

The HOF program has been coordinated by Montana Fish, Wildlife and Parks (MFWP) since 1995-96, and is currently used in 132 classrooms throughout the state. The goals of the HOF program in Montana are: (1) to introduce students, teachers, and parents to the fish and aquatic resources of Montana; and (2) to promote fishing and outdoor recreation as a positive activity. The objectives are:

1. To help students develop an awareness and appreciation for the fish and aquatic resources in Montana.
2. To help students develop an interest in fishing and outdoor recreation.
3. To teach safe and responsible outdoor skills.
4. To help teachers develop skills and an interest in teaching fisheries and natural resource topics.

Lisa's study involves surveying all students, teachers, and instructors in the HOF program. The survey results of HOF students in 4^{th} and 5^{th} grades need to be compared to students who have not participated in the HOF program. Therefore, Lisa needs to survey 4^{th} and 5^{th} grade students in approximately twelve schools through out Montana. She is asking for each teacher's willingness to allow her to administer the 20 minute *Fishing in Montana* survey in each classroom with the students and parental permission for each student voluntarily participating.

Lisa will read each question aloud to the students before they answer the questions. The survey will not be graded, and there are no "right" or "wrong" answers. She will need to administer the survey with the students this spring – during May – and again with the same students, then 5^{th} and 6^{th} grade students, during the month of September 2006.

The survey date and time will be mutually scheduled to meet the needs of each teacher and their students. The names of schools, teachers, and students will remain strictly confidential. Parental permission forms, student ascent forms, and student surveys will be provided by Lisa; the forms are attached for further information. If you have any questions, please contact Lisa Flowers, 406-466-2078.

Dear Parent or Legally Authorized Representative:

I am a doctoral student in the College of Forestry and Conservation at the University of Montana. My study involves evaluating the effectiveness of a conservation education program by assessing student knowledge, attitudes, skill, and intended behavior. I will specifically be evaluating Montana Fish, Wildlife and Parks' *Hooked on Fishing* (HOF) education program.

I am requesting your permission to ask your child to respond to a short – 20 minute – survey on fishing knowledge, attitude, skill levels, and intended behaviors related to the outdoors and natural resources both in May 2006, and again in September 2006. I will read all survey questions aloud to the students before they answer the questions. The survey will not be graded, and there are no "right" or "wrong" answers. I only ask that each student respond honestly to the questions.

Each student survey will be coded so I can correlate the first survey with the second for each student participating voluntarily. Your child's answers are strictly confidential, and you and your child's identity will be kept confidential. The name of the school and the teacher will also remain confidential. If you would like a copy of the survey results, please check the appropriate box below and provide your mailing address.

If you are willing to grant your permission for your child to participate, please sign the form at the bottom of the page, and have your child return it to his or her teacher no later than **May 5, 2006.** If you have any questions concerning this survey, please call me at 406-466-2078.

Sincerely,
Lisa Flowers
Doctoral Student
College of Forestry and Conservation, The University of Montana

---

Tear Along this line – and send lower part to school with your child.

Non Hooked on Fishing School Parental Consent Form
Please Return by: May 5, 2006

*Please check **all** boxes that apply:*

- ☐ I give my son/daughter permission to take the ***Fishing in Montana*** survey during May 2006 and September 2006 with their respective classroom teacher.
- ☐ I would like a copy of the survey results. (Please provide mailing address below)

Child's Name: _____
Classroom Teacher: _____
School Name: _____
Date: _____
Parent's/Guardian's Signature: _____
Parent's/Guardian's Name: _____
Mailing Address: _____

Howdy!

This is a survey for Montana students like you who are in 4th and 5th grade this year in school.

The purpose of this survey is to find some answers from students who, like you, are NOT involved in a conservation education program called "Hooked on Fishing" which is coordinated by Montana Fish Wildlife and Parks. This survey is NOT a TEST, and will NOT be graded. The questions asked in this survey will focus on fishing related skills, behaviors, knowledge, and attitudes that you have RIGHT NOW. Your answers will help Montana Fish, Wildlife and Parks make a better program for future teachers and their students.

The survey should take about 20 minutes to complete. Your name and survey answers will be completely confidential – which means your name will not be used with the survey results. You may stop taking this survey at any time if you choose to do so.

Survey Directions

•I will read each question as you read along, look at the answer selections, and make your selection for each question.
•A couple of questions require that you write an answer. Spell the word the best you can, you may print or write in cursive.
•Mark (X) , or (√) each box in front of the answer you think is the best choice for you.
•Respond honestly, there are no right or wrong answers.
•If you have a question, at any time, please ask.
•If you agree to participate in this survey please sign your first and last name on the line below, and fill in the date.

•Print Your Name:_____
•
•SignYourName:_____

•Date: _____

☺Thank you!

Montana Fish, Wildlife & Parks

Post-Student Survey -- Fishing in Montana

Teacher:_____
Student Post-Survey Code:_____
Today's Date:_____

SECTION ONE: Please describe a few things about yourself.

1. **What grade are you in this year?** ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ 7th ☐ 8th

2. **Are you:** ☐ a girl? **OR** ☐ a boy?

3. **How old are you?** _____

4. **What is your favorite fish found in Montana waters?** _____

5. **What is your favorite subject in school?** _____

SECTION TWO: What are your feelings NOW about fish, water habitats in Montana, and outdoor activities.

6. **On a nice day, would you rather be inside doing something like watching TV or playing outside?**
☐inside ☐outside ☐ I am not sure

7. **How much do you like outdoor activities like hiking, camping, hunting, fishing etc.?**
☐very much ☐sort of ☐not at all

8. **When you think about fish, you think they are:**
☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

9. **When you think about outdoor activities, you think they are:**

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

10. How interested are you in learning <u>MORE</u> about Montana fish and the waters where they live?

☐very interested ☐sort of interested ☐not very interested ☐do not care

11. How do you feel about learning science in your classroom?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

12. How do you feel about learning science in your classroom <u>AND</u> in the outdoors?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

13. Choose the sentence below which <u>BEST</u> describes how you <u>CARE</u> about Montana fish and where they live?

☐I care a lot ☐I care some ☐I don't care at all

14. Choose the sentence below which <u>BEST</u> describes how you <u>FEEL</u> about fishing:

☐ I love to fish.
☐ Fishing is ok.
☐ I will go fishing, but I don't like it very much.
☐ I would rather not go fishing.
☐ I am not sure at this time.

15. HOW IMPORTANT is each of the following activities to you personally. Please mark one box for each item below.

a. Visiting and exploring places such as creeks, ponds, lakes, and wetlands.

☐Very important ☐Somewhat important ☐Not Important

b. Helping to take care of places in your local area where plants, fish, and wildlife live.

☐Very important ☐Somewhat important ☐Not Important

c. Thinking about how your outdoor activities might affect plants, fish and wildlife that live in or near water.

☐Very important ☐Somewhat important ☐Not Important

d. Using water carefully.

☐Very important ☐Somewhat important ☐Not Important

Question 15 Continued: HOW IMPORTANT each is to you personally.

e. **Helping to make sure that people in the future have clean water to drink.**
☐Very important ☐Somewhat important ☐Not Important

f. **Helping to make sure that people in the future have places to enjoy the outdoors.**
☐Very important ☐Somewhat important ☐Not Important

SECTION THREE: Think about your BEHAVIORS, and what you think YOU might do in the future.

16. Have you ever been fishing in your lifetime?
☐ Yes ☐ No (skip to question #21)

17. If yes, how many times during the past YEAR did you go fishing?
☐6 or more ☐4 or 5 ☐2 to 3 ☐1 ☐not at all

18. If yes, who taught you to fish? *Pick everyone you taught you.*
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives
☐other people (like your teacher)

19. If yes, who do you fish with? *Pick everyone you fish with.*
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives
☐other people (like your teacher)

20. If yes, do you think you will continue to fish in the future?
☐ Yes ☐ No ☐ Maybe

21. Do you think you will EVER want to go fishing in your lifetime?
☐ Yes ☐ No

SECTION FOUR: Right NOW, how well do you KNOW HOW to do the things listed below.

22. Picking a place to go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

23. Reading the fishing laws and knowing what they are BEFORE you go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

24. Carefully, handling a fish you have caught.

☐very well ☐pretty well ☐not very well ☐don't know how at all

25. Carefully, releasing a fish you decide not to keep.

☐very well ☐pretty well ☐not very well ☐don't know how at all

26. Carefully, cleaning (or gutting) the fish you catch.

☐very well ☐pretty well ☐not very well ☐don't know how at all

27. Correctly, identify different kinds of fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

28. Using different kinds of fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

29. Taking care of your fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

30.Casting your fishing line into the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

31.Tying good fishing knots in your fishing line.

☐very well ☐pretty well ☐not very well ☐don't know how at all

32.Ice fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

33.Cleaning up the area where you fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

34.Following the fishing laws WHEN fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

35.Being safe around and in the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

SECTION FIVE: Right NOW, how MUCH do you think you KNOW about the fish and fishing in Montana.

36.Montana fishing laws.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

37.The different native and not (non) native fish in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

38. The different names of fish found in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

39. The things that make good habitat for fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

40. The importance of clean water to people, plants, and animals.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

41. The water in Montana and where it is found.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

42. The different kinds of bugs and insects that live in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

43. The body parts of a fish and what they do for the fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

44. The jobs that people have that work with fish and wildlife in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

45. The jobs that people have that work with science and the natural world.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

Thank you very much!! ☺

Appendix D

- Extended Post-Survey Instrument for HOF Students
- Letter to NON HOF Teachers for Extended Post-Survey
- Extended Post-survey Instrument for NON HOF Students

Extended-Post Student Survey -- Hooked on Fishing in Montana

Teacher:_____

Student Post Post-Survey Code:_____

Today's Date:_____

SECTION 1: Please describe a few things about yourself.

1. **What grade are you in this year?** ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ 7th ☐ 8th

2. **Are you:** ☐ a girl? **OR** ☐ a boy?

3. **Today, how old are you?** _____

4. **What was your favorite Hooked on Fishing activity?** _____

SECTION 2: What are your feelings NOW about fish, water habitats in Montana, and outdoor activities.

5. **On a nice day, would you rather be inside doing something like watching TV or playing outside?**

☐inside ☐outside ☐ I am not sure

6. **How much do you like outdoor activities like hiking, camping, hunting, fishing etc.?**

☐very much ☐sort of ☐not at all

7. **When you think about fish, you think they are:**

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

8. When you think about outdoor activities, you think they are:

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

9. How interested are you in learning <u>MORE</u> about Montana fish and the waters where they live?

☐very interested ☐sort of interested ☐not very interested ☐do not care

10. How do you feel about learning science in your classroom?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

11. How do you feel about learning science in your classroom <u>AND</u> in the outdoors?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

12. Choose the sentence below which <u>BEST</u> describes how you <u>CARE</u> about Montana fish and where they live?

☐I care a lot ☐I care some ☐I don't care at all

13. Choose the sentence below which <u>BEST</u> describes how you <u>FEEL</u> about fishing:

☐ I love to fish.
☐ Fishing is ok.
☐ I will go fishing, but I don't like it very much.
☐ I would rather not go fishing.
☐ I am not sure at this time.

14. HOW IMPORTANT is each of the following activities to you personally.

a. Visiting and exploring places such as creeks, ponds, lakes, and wetlands.

☐Very important ☐Somewhat important ☐Not Important

b. Helping to take care of places in your local area where plants, fish, and wildlife live.

☐Very important ☐Somewhat important ☐Not Important

c. Thinking about how your outdoor activities might affect plants, fish and wildlife that live in or near water.

☐Very important ☐Somewhat important ☐Not Important

d. Using water carefully.
☐Very important ☐Somewhat important ☐Not Important

e. Helping to make sure that people in the future have clean water to drink.
☐Very important ☐Somewhat important ☐Not Important

f. Helping to make sure that people in the future have places to enjoy the outdoors.
☐Very important ☐Somewhat important ☐Not Important

SECTION 3: Think about your BEHAVIORS, and what you think YOU might do in the future.

15. How many times during the PAST SUMMER did you go fishing?
☐6 or more ☐4 or 5 ☐2 to 3 ☐1 ☐not at all

16. Who taught you to fish? ***Pick everyone you taught you.***
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives
☐other people (like your teacher)

17. Who do you fish with? ***Pick everyone you fish with.***
☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives
☐other people (like your teacher)

18. Do you think you will continue to fish in the future?
☐ Yes ☐ No ☐ Maybe

SECTION 4: Right NOW, how well do you KNOW HOW to do the things listed below.

19. Picking a place to go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

20. Reading the fishing laws and knowing what they are BEFORE you go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

21. Carefully, handling a fish you have caught.

☐very well ☐pretty well ☐not very well ☐don't know how at all

22. Carefully, releasing a fish you decide not to keep.

☐very well ☐pretty well ☐not very well ☐don't know how at all

23. Carefully, cleaning (or gutting) the fish you catch.

☐very well ☐pretty well ☐not very well ☐don't know how at all

24. Correctly, identifying different kinds of fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

25. Using different kinds of fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

26. Taking care of your fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

27. Casting your fishing line into the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

28. Tying good fishing knots in your fishing line.

☐very well ☐pretty well ☐not very well ☐don't know how at all

29. Ice fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

30. Cleaning up the area where you fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

31. Following the fishing laws WHEN fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

32. Being safe around and in the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

SECTION 5: Right NOW, how MUCH do you think you KNOW about the fish and fishing in Montana.

33. Montana fishing laws.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

34. The different native and not (or non) native fish in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

35. The different names of fish found in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

36. The things that make good habitat for fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

37. The importance of clean water to people, plants, and animals.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

38. The water in Montana and where it is found.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

39. The different kinds of bugs and insects that live in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

40. The body parts of a fish and what they do for the fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

41. The jobs that people have that work with fish and wildlife in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

42. The jobs that people have that work with science and the natural world.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

Thank you very much!! ☺

Dear _____

Now that the new school has begun again, I am contacting you to see if I can work with you again to conduct the “Fishing in Montana” survey with the same students who were in your class last year, but are now 5th or 6th graders. This will be the last survey for the purposes of my graduate research project to assess the effectiveness of the “Hooked on Fishing” conservation education program for Montana Fish, Wildlife, & Parks.

I would appreciate it if you would first let me know if this will be possible. The process would include me sending you the new surveys with a list of the students that took the survey last spring. Then you and/or their new teacher will handout the surveys, provide the brief survey directions, the survey should only take the students about 10 minutes to complete. The survey is the exact one they took last May, only on different color paper.

If this is possible for you, I will send the surveys to you with a self addressed and stamped return envelope so you can return all the surveys to me. If a student has moved or is not in school the day you decide to give the survey; that is not a problem.

If you have any questions, please contact me at anytime either by email flowers@boone-crockett.org or by phone at home 406.466.2078 or cell 406.781.1721.
Please let me know as soon as possible whether you think this is doable or not.

Thank you very much for your consideration and time.

Sincerely,

Lisa Flowers

Extended-Post Student Survey -- Fishing in Montana

Teacher:_____
Student Post Post-Survey Code:_____
Today's Date:_____

SECTION 1: Please describe a few things about yourself.

1. **What grade are you in this year?** ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ 7th ☐ 8th

2. **Are you:** ☐ a girl? **OR** ☐ a boy?

3. **Today, how old are you?** _____

SECTION 2: What are your feelings NOW about fish, water habitats in Montana, and outdoor activities.

4. **On a nice day, would you rather be inside doing something like watching TV or playing outside?**

☐inside ☐outside ☐ I am not sure

5. **How much do you like outdoor activities like hiking, camping, hunting, fishing etc.?**

☐very much ☐sort of ☐not at all

6. **When you think about fish, you think they are:**

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

7. **When you think about outdoor activities, you think they are:**

☐really cool ☐sort of cool ☐ok ☐sort of boring ☐ really boring

8. **How interested are you in learning <u>MORE</u> about Montana fish and the waters where they live?**

☐very interested ☐sort of interested ☐not very interested ☐do not care

9. How do you feel about learning science in your classroom?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

10. How do you feel about learning science in your classroom <u>AND</u> in the outdoors?

☐ very good ☐pretty good ☐good ☐not so good ☐ don't like it

11. Choose the sentence below which <u>BEST</u> describes how you <u>CARE</u> about Montana fish and where they live?

☐I care a lot ☐I care some ☐I don't care at all

12. Choose the sentence below which <u>BEST</u> describes how you <u>FEEL</u> about fishing:

☐ I love to fish.
☐ Fishing is ok.
☐ I will go fishing, but I don't like it very much.
☐ I would rather not go fishing.
☐ I am not sure at this time.

13. HOW IMPORTANT is each of the following activities to you personally. Please mark one box for each item below.

a. Visiting and exploring places such as creeks, ponds, lakes, and wetlands.

☐Very important ☐Somewhat important ☐Not Important

b. Helping to take care of places in your local area where plants, fish, and wildlife live.

☐Very important ☐Somewhat important ☐Not Important

c. Thinking about how your outdoor activities might affect plants, fish and wildlife that live in or near water.

☐Very important ☐Somewhat important ☐Not Important

d. Using water carefully.

☐Very important ☐Somewhat important ☐Not Important

e. Helping to make sure that people in the future have clean water to drink.

☐Very important ☐Somewhat important ☐Not Important

f. Helping to make sure that people in the future have places to enjoy the outdoors.

☐Very important ☐Somewhat important ☐Not Important

SECTION 3: Think about your BEHAVIORS, and what you think YOU might do in the future.

14. Have you ever been fishing in your lifetime?

☐ Yes ☐ No (*GO TO question #21*)

15. If yes, how many times during the past SUMMER did you go fishing?

☐6 or more ☐4 or 5 ☐2 to 3 ☐1 ☐not at all

16. If yes, who taught you to fish? *Pick everyone you taught you.*

☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives

☐other people (like your teacher)

17. If yes, who do you fish with? *Pick everyone you fish with.*

☐friends ☐brothers ☐sisters ☐parents ☐grandparents ☐other relatives

☐other people (like your teacher)

18. If yes, do you think you will continue to fish in the future?

☐ Yes ☐ No ☐ Maybe

19. Do you think you will EVER want to go fishing in your lifetime?

☐ Yes ☐ No

SECTION 4: Right NOW, how well do you KNOW HOW to do the things listed below.

20. Picking a place to go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

21. Reading the fishing laws and knowing what they are BEFORE you go fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

22. Carefully, handling a fish you have caught.

☐very well ☐pretty well ☐not very well ☐don't know how at all

23. Carefully, releasing a fish you decide not to keep.

☐very well ☐pretty well ☐not very well ☐don't know how at all

24. Carefully, cleaning (or gutting) the fish you catch.

☐very well ☐pretty well ☐not very well ☐don't know how at all

25. Correctly, identify different kinds of fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

26. Using different kinds of fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

27. Taking care of your fishing equipment.

☐very well ☐pretty well ☐not very well ☐don't know how at all

28.Casting your fishing line into the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

29.Tying good fishing knots in your fishing line.

☐very well ☐pretty well ☐not very well ☐don't know how at all

30.Ice fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

31.Cleaning up the area where you fish.

☐very well ☐pretty well ☐not very well ☐don't know how at all

32.Following the fishing laws WHEN fishing.

☐very well ☐pretty well ☐not very well ☐don't know how at all

33.Being safe around and in the water.

☐very well ☐pretty well ☐not very well ☐don't know how at all

SECTION 5: Right NOW, how MUCH do you think you KNOW about the fish and fishing in Montana.

34.Montana fishing laws.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

35.The different native and not (or non) native fish in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

36.The different names of fish found in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

37. The things that make good habitat for fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

38. The importance of clean water to people, plants, and animals.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

39. The water in Montana and where it is found.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

40. The different kinds of bugs and insects that live in Montana waters.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

41. The body parts of a fish and what they do for the fish.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

42. The jobs that people have that work with fish and wildlife in Montana.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

43. The jobs that people have that work with science and the natural world.

☐ know a lot ☐ know some ☐ don't know much ☐ don't know anything

Thank you very much!! ☺

Appendix E

- Letter to HOF Teacher for Internet Survey
- HOF Internet Teacher Survey Question Guide
- Answers to Open-ended Teacher Survey Questions
  - Suggestions Teachers had to Improve HOF
  - Recommendations for Future HOF Teachers
  - Other Comments About HOF

Dear Hooked on Fishing Teacher:

Most of you met Lisa Flowers at the fall teacher Hooked on Fishing (HOF) workshops and again when she has come to your classroom to administer the Hooked on Fishing pre-survey to your students. As you know, Lisa is currently working on a research project sponsored by Montana Fish, Wildlife & Parks and the Boone and Crockett Club; she is specifically evaluating Montana Fish, Wildlife and Parks' *Hooked on Fishing* education program. The purpose of her study is to evaluate the effectiveness of a conservation education program by assessing student knowledge, attitudes, skill, and intended behavior.

You are being asked to participate voluntarily because you are a HOF teacher. The HOF teacher survey is being conducted with all of the teachers that are involved in the program during the 2005-06 school year. The purpose of conducting this survey is to gain a more in-depth understanding of the students' self-reported pre-post answers to the survey questions, and to compare the results with the HOF instructor interviews.

Survey Goals:

- Summary/highlights of HOF experiences (in classroom, in field, other)
- Assess perceptions of HOF Teachers goals, objectives for the programs and activities they do with their students.
- Assess perceptions of HOF teachers concerning program support and resource needs.
- Recommendations for future HOF teachers, recommendations to improve the HOF program.

Survey Protocol:

Teachers choosing to participate in the survey will remain confidential. By making the decision to participate in the survey you are willingly giving your consent to use the results in this study. The results gathered from the survey instrument will be aggregated and all identifiers will be stripped

All on-line surveys will only be received by Lisa Flowers. All surveys will be destroyed – via deleting the electronic file or via a paper shredder if hard copies are made - upon the completion of the final report and dissertation.

The survey will be launched via e-mail by May 8, 2006 with a requested deadline for responses no later than June 9, 2006. Those teachers without email access will be sent a paper survey in the postal mail. Beginning May 22nd, all non-respondents will receive e-mail or postal mail reminder notices until June 5, 2006 encouraging a high response rate.

If you have any questions, please contact Lisa Flowers, 406-466-2078.

Hooked on Fishing (HOF) Internet Teacher Survey Question Guide

Survey Goals:

- Summary/highlights of HOF experiences (in classroom, in field, other)
- Assess perceptions of HOF Teachers goals, objectives for the programs and activities they do with their students.
- Assess perceptions of HOF teachers concerning program support and resource needs.
- Recommendations for future HOF teachers, recommendations to improve HOF program.

General Program Information

1. What month did you begin the HOF program this year?
    a. Choice: Sept, Oct, Nov, Dec, Jan, Feb, March
2. What initially made you interested in the HOF program?
    a. Open ended
3. Why did you decide to start the HOF program in your school?
    a. Open-ended
4. How did you start the HOF program in your school?
    a. Open-ended
5. Does the HOF program meet all of the educational expectations you have for this type of program?
    a. Choice: Yes or No
6. If No, what educational expectations are not being met?
    a. Open-ended
7. To what extent would you recommend the HOF program to other teachers?
    a. Choice – strongly recommend, somewhat recommend, not recommend
8. How many years have you been involved with HOF?
    a. Choice - # of years
9. How many years have you been teaching?
    a. Choice - # of years

HOF Program Activities

10. What core HOF activities do you like the best?
    a. Choices – which do you like the least – or which is most and least valuable
11. What core HOF activities do you think your students like best?
    a. Choices – list core activities
12. How many times during the school year do you and your students participate in HOF activities that are NOT presented by a HOF instructor?
    a. Choices – not at all, 1, 2, 3, 4, 5 or more
13. Would you prefer to have the HOF activities offered in one large block over a few weeks, or spread out over the entire year?
    a. Choices – one large block over a 2-3 week period, spread out over the entire year

HOF Program Value

14. What value(s) does the HOF program provide for you as a teacher?
    a. Open-ended
15. What benefits does the HOF program provide for your students?
    a. Open-ended
16. In what way do you feel the HOF program has impacted parental involvement in your classroom?
    a. Choice – greatly increased, moderately increased, no change

HOF Program Field Experiences

17. How many times did you and your students participate in outdoor HOF experiences?
    a. Choice – 0, 1, 2, 3, 4, 5 or more
18. When your class goes outdoors to do HOF activities, who helps you chaperone your students?
    a. Choice – school administrator, parents, other teachers, community member, a student's relatives, other – select all that apply.
19. How would you rate the quality of the HOF field trips/experiences for you the teacher, the students, parents, administrators, or others?
    a. Choice – Teacher, students, parents, administrators, others – scale: High; Medium High; Medium; Medium Low; Low
20. What types of HOF field experiences did you and your students participate in this year?
    a. Choice – select all that apply – ice fishing, open water, rafting, local field trip to wetland, other field experience

HOF Program Outcomes

21. To what extent has the HOF program affected your students' knowledge of fishing and aquatic resources?
    a. Choice – strongly improved, somewhat improved, neither improved or declined, somewhat declined, strongly declined
22. To what extent has the HOF program affected your students' fishing and outdoor skill levels?
    a. Choice – strongly improved, somewhat improved, neither improved or declined, somewhat declined, strongly declined

23. To what extent has the HOF program impacted the likelihood that your students will continue to fish?
    a. Choice – strongly improved, somewhat improved, neither improved or declined, somewhat declined, strongly declined

24. To what extent has the HOF program affected the attitudes of those students who had never fished or had few opportunities to enjoy the outdoors?
    a. Choice - Choice – strongly improved, somewhat improved, neither improved or declined, somewhat declined, strongly declined

25. To what extent has the HOF program affected your students' intentions to be stewards of natural resources?
    a. Choice - Choice – strongly improved, somewhat improved, neither improved or declined, somewhat declined, strongly declined

26. How has the HOF program affected the amount of time you spend teaching about fish, fishing, and aquatic resources during the school year?
    a. Choice - Choice – strongly improved, somewhat improved, neither improved or declined, somewhat declined, strongly declined

HOF Program Effectiveness

27. How would you **rate** the overall effectiveness of the HOF program components:
    a. Fall Teacher Workshop
    b. Classroom Activities
    c. HOF Instructors
    d. Program Resources & materials provided to classrooms
    e. Support for Program from school administration.
    f. Field Experiences

Recommendations for future HOF Teachers, recommendations to improve HOF

28. What recommendations do you have for future HOF teachers?
    a. Open-ended
29. What suggestions do you have to improve the functioning of the HOF Program?
    a. Open-ended
30. What has been the most challenging part of being a HOF teacher for you?
    a. Open-ended

Final comments

31. Any final comments about anything we've talked about, or not talked about, that you would like to share related to the HOF program in Montana?
    a. Open-ended

Suggestions Teachers had for Improving the HOF Program

74 teachers responded to this question, 50% had no suggestions, only commented that the programs runs very well, everyone involved doing a great job. Other comments were:

- Pre-schedule all programs prior to beginning of the year.
- It would be nice to have a place where there was more fishing action.
- Love to see some fourth grade reading level materials developed for extension lessons.
- More field trips, more outdoor activities.
- Colder temperatures in the winter so we can ice fish.
- More instructors for availability during popular times for outdoor field trips; added personnel to come in and do more presentations and hands on activities.
- We still struggle with bussing issues. If we could have help with that it would be great.
- Would like to have the fall in-service later in Sept. or early October.
- Continue sharing ideas/activities that people use in the classrooms I really think it is neat when students can help stock ponds, etc. or count fish.
- As a teacher who has participated for many years, I would rather not attend the fall seminar for teachers.
- Handout packet written by teachers who have participated for years with an outline of what the program entails and advice for new teachers.

- Would like more help with maintenance of equipment; could we also have a tackle box of things like sinkers, bobbers, hooks etc to repair things when we are in the field?
- My class enjoys this program as third graders. BUT, I really believe it would be better at 4th grade because they teach MT History. Fish, water ways, insects etc are taught and the Fishing Program would supplement the curriculum.
- Think it would help to have some activities or cooperative exercises that the students take home to do with their parents.
- Would also like to see a catch and release policy promoted by the hooked on fishing program. I don't have a problem with eating fish, but I do not like the waste that I have seen in the past. I would recommend either frying the fish for them on site, or having them let the fish go.
- Would also like to see the students become more involved in something that seems substantial to them. I think it would be a neat (addition to the) program to have classes adopt sections of river or fishing sites that they clean and can take some pride in. I think it would be very beneficial for the students to see how much of an effort goes into keeping areas clean.
- Did not know about some of the programs offered i.e. water safety, fishing regulations. It would be nice to have a list of available activities to choose from.

- Excellent program-smaller-much smaller groups at Lake Elmo. Spread it out over several days or maybe different locations such as Riverfront Park or the Yellowstone-they need to catch fish.

Recommendations to Future HOF Teachers

- Have clear expectations of student behavior on field trip-articulate to students beforehand. Bring Ziploc bags and sharpie marker for keeping fish. Wet wipes, first aid kit, and cell phone have been helpful also.
- Send personal invitations to adults to come and participate with the students.
- Make it an important part of curriculum.
- Link up with the Adopt a Fish Program!
- Teachers must have a desire to improve students awareness to outdoor activities

Other Comments about HOF

- Really enjoy the HOF program and my students do too. It is a great way to get students to view nature and enjoy it while fishing. It is something they can enjoy all their lives.
- Thanks for your hard work and effort in bring the outdoors and fishing to the children in Montana.
- Thank you for a great experience for our children, you come so self-contained, I don't have to supply anything!

- I have greatly enjoyed the program, and have loved how it increased the students' interest in science and in wildlife.
- I want to thank you for all your hard work. This is so much fun for the students and it gives them some knowledge of how to fish, the laws, and the area in which they live. Thank you!!!
- This is an excellent program that introduces many students to outdoor activities that they might otherwise never have had the opportunity to experience. The joy on a student's face when they have caught their first fish ever is phenomenal! The program helps students with their patience and perseverance. Some have to learn that they can do all of the right things and not catch a fish on any given trip and yet they can still have fun and enjoy the camaraderie and outdoors. Thanks for putting together this wonderful program!
- We are grateful for this program. It has had a very powerful impact on our school and the students' attitudes. The quality of instruction, variety of activities, flexibility of scheduling, and patience of (the) presenters have brought about a deep appreciation and respect for Montana fisheries and wildlife. Thank you!
- I have students write papers at the end of the year. Every year when they write their paper they write about their favorite activities. Every year the fishing trips and HOF activities are their favorite.
- Thank you for your time and energy in providing this program. It truly does affect my students in many positive aspects of their thinking and habits.

Some of this growth can not be measured with a score or reported on paper. It is a child friendly program that I would hate to lose.

- This is a great program that benefits young and old.
- This is a marvelous program that really engages the students to learn more about the outdoors.
- I hope it can continue to be funded, because it is one of the special things we can offer here in Montana which has a lasting impact on students and the environment. It also involves parents in ways that I have not seen in any other program during my 20+ years in education, and it involves parents who may not normally volunteer in school/classroom activities.
- I am very impressed with this program. Before I taught 4th grade I didn't understand the impact the program had on student. I have seen firsthand how excited the students are about fishing and caring for the environment. They are all talking about the fishing they hope to do this summer and many spend hours after school fishing now, rather than watching T.V. and playing video games. Hooray for this great program--thank you.
- I found this program to be the single most influential experience my students were exposed to. They learned, they grew as students, and they gained confidence as they experienced nature and developed new skills. They also developed teamwork and a sense of responsibility. I found lots of opportunities to spin other academics from their interest in fishing.
- This is an awesome program and hope that it can be continued. My students look forward to it every year.

- Impressed with the resources and commitment of individuals who like to work with young minds. Thanks for the commitment to students.
- Thank you for a tremendous experience. Our students often come back to us from fifth grade and ask if they can do the program again.
- Allow other schools to participate in fish planting activities. It seems as though (one specific) school has been allowed to do this activity over and over again... This activity should be on a rotating basis (with other schools).
- It would be great if this survey could be shortened. Many of the questions are repeated in one form or another. We all appreciate and enjoy the HOF program and all the time that is put in by volunteers. This survey took about 20 minutes to complete which is almost the entire amount of our prep time in a day. So.....if it could be shortened in the future it would be greatly appreciated.
- Hopefully this survey will not be done every year as this took a lot of time. I feel you could have done it with fewer questions and gotten the same information. There also were not places that if you didn't do that activity or hadn't done it yet to respond.

Appendix F

- Letter to HOF Instructors for Open-ended Structured Interview
- HOF Instructor Open-ended Structured Interview Instrument
  - Answers to Open-ended Instructor Interview Questions
    - Elements that Helped or Hindered Achieve Program Goals
    - Liked Best About HOF
    - Liked Least About HOF
    - Significant Experiences with HOF
    - Judge Success of HOF Program
    - Challenges of Being a HOF Instructor
    - Suggested Changes to Improve HOF
    - Suggested Ways to Make Program Changes
    - Recommendations for Future HOF Instructors
    - Suggestions to Improve HOF

Dear Hooked on Fishing Instructor:

Most of you met Lisa Flowers at the fall teacher Hooked on Fishing (HOF) workshops and again when she worked with you to administer the Hooked on Fishing pre-survey to the students you work with in your HOF program. As you know, Lisa is currently working on a research project sponsored by Montana Fish, Wildlife & Parks and the Boone and Crockett Club; she is specifically evaluating Montana Fish, Wildlife and Parks' *Hooked on Fishing* education program. The purpose of her study is to evaluate the effectiveness of a conservation education program by assessing student knowledge, attitudes, skill, and intended behavior.

The HOF instructor interview is being conducted with all of the instructors that are involved in the program during the 2005-06 school year. The purpose of conducting this interview is to gain a more in-depth understanding of the students' self-reported pre-post answers to the survey questions, and to compare the results with the HOF teacher survey results.

Lisa will be contacting you by phone or email to set up your interview at a mutually convenient time. You both will set a time, and she will call or meet you at the specified time. If a telephone interview is prearranged, she will call you at the number you have provided. Your interview will be voluntary and confidential. All survey results will be reported in the aggregate, and all personal and school identifiers will be removed.

Each interview will take no more than 1 hour to complete. Lisa will use the same set of questions for each interview. Prior to beginning the interview, you will be asked by Lisa for your verbal permission to audio-record the interview. Your interview will be audio-recorded only if you have provided verbal permission to Lisa.

<u>The goals of the interview are to:</u>

- Summary/highlights of HOF experiences (in classroom, in field, other).
- Assess perceptions of HOF instructors' goals, objectives for the programs and activities they offer.
- Assess perceptions of HOF instructor program support and resource needs.
- Recommendations for future HOF instructors, recommendations to improve the HOF program.

<u>The guidelines for the interview are as follows:</u>

- Instructors choosing to participate in the interview will remain confidential. By making the decision to participate each instructor is willingly giving their consent to use the results in this study. The interview questions will be sent out to each instructor at least one week prior to the scheduled interview. Each interview will last no longer than one hour.

- Each instructor will be asked prior to the interview whether or not they will allow Lisa to record the interview for transcription purposes. All audio-

tapes will be destroyed upon the completion of the final report and dissertation.

- Each interview will be scheduled at a mutually convenient time from June 1, 2006 through June 30, 2006. Lisa will make the phone calls to the instructors at a predetermined telephone number. All telephone interviews will be conducted by Lisa Flowers.

- If there are any questions, please contact Lisa Flowers, 406-466-2078.

Sincerely,
Dave Hagengruber
HOF Program Coordinator

2006 Hooked on Fishing (HOF) Instructor Interview Guide

Interview Goals:

- Summary/highlights of HOF experiences (in classroom, in field, other).
- Assess perceptions of HOF instructors' goals, objectives for the programs and activities they offer.
- Assess perceptions of HOF instructor program support and resource needs.
- Recommendations for future HOF instructors, recommendations to improve HOF program.

Goals	Questions
Background Demographic Info.	1. How long have you been a HOF Instructor? 2. Did you have teaching experience prior to working with the HOF program? 3. How did you first hear about HOF? 4. What were the factors which made you want to be a HOF instructor? 5. What MFWP region(s) are you a HOF instructor in? 6. How many HOF programs do you do a year? In the classroom? Out of the classroom?
Goals	7. Think back to when you decided to become a HOF instructor. What were your goals for participating in the program? 8. What have been the elements/situations of your experience that hindered or helped achieve these goals? 9. What are the main objectives for your HOF programs?
HOF Activities	10. Describe what you like best about the HOF program. 11. Describe what you like least about the HOF program. 12. What are the HOF activities you conduct? 13. Which HOF activity do you like best? Which HOF activity do you like least? 14. If, you could change anything about the HOF program you provide, what would it be? 15. How would you make those changes in the HOF program you provide?
Resources & Support	16. Do you have time and resources to adequately do the HOF Instructor job? 17. Do you have community assistance?
Significant Experience	18. How would you describe the significant experiences you have had with the HOF program? 19. How do you judge the success of the HOF program and activities you provide?
Recommendations for future HOF Instructors, recommendations to improve HOF	20. What has been the most challenging part of being a HOF instructor for you? 21. What recommendations do you have for future HOF instructors? 22. What suggestions do you have to improve the functioning of the HOF program?
Final comments	23. Any final comments about anything we've talked about, or not talked about, that you would like to share related to the HOF program in Montana?

Answers to Open-ended Instructor Interview Questions

Elements that Helped or Hindered Achieve Program Goals

Nineteen percent of the instructors felt they had the necessary time and resources to conduct their programs. However, 79% expressed the need for more time and money to adequately do their job. The instructors have businesses, organizations, and individuals that have provided community assistance to local HOF programs. Community assistance has come from students' parents, school administrators and office staff, Plum Creek Foundation, Walleyes Unlimited, Bureau of Land Management, Missouri River Flyfishers, Snappy's Sporting Goods Store, Sportsman Ski Haus, First Interstate Bank, Albertson's, American Legion, Custer Rod and Gun Club, Pike Masters, Wildlife Unlimited, Optimist Club, Federation of Fly Fishermen, and law enforcement, fisheries, and wildlife staff from MFWP.

Elements which have helped achieve these goals have been:

- Balance the time between schools, and the lack of time to get everything done.
- Biggest hindrance is the geography and size of the State.
- Makes a difference when a teacher signs up for the program on their own versus a school administrator mandating that the teachers in a particular grade level must participate in the program.
- Having past teaching experience made it easier to fit the program into a teacher's schedule.

- Very helpful to have parents involved in the program.
- Having access to fishing location to provide the chance for every student to actually catch a fish has definitely helped with the success of the program.
- Help from MFWP fisheries and law enforcement folks.

Liked Best about the HOF Program

- Smile on the students' faces when they catch their first fish.
- Repeated interaction with students and teachers.
- Fun working with students, reminds me of being a kid and wanting to go fishing.
- Like to watch the students' progress, engagement and look forward to doing more with them.
- Enthusiasm of the teachers and the students for the program when we show up to their classrooms.
- Have parent involvement with the students when we go fishing.
- The consistency in the basic components of the program.
- The flexibility of the program, that there are 4 or 5 basic activities to do and then allows the option to choose from the other activities if there is time.
- Meeting the students and the teachers and having them learn to think about what is going on under the water's surface.

Liked Least about the HOF Program

- Teachers who don't express an interest in the program.
- Teachers not doing their part, for example not having enough adult supervision or not having fishing equipment (rods and reels) ready to go.
- Unengaged teachers, love to go into a classroom where a teacher has taken the time to review the pertinent information prior to activity or field experience.
- Not enough parental help, although it is important to consider that many students come from single parent homes, these parents may not be able to afford the time and effort.
- Not enough time to do the program justice.
- Sometimes scheduling is tough especially in the spring, and when considering the needs of other school related activities.
- Amount of prep time necessary to be prepared for classroom activity. That is the hardest, don't get paid for it, but it is very necessary to conducting the activity within the allotted amount of time available.
- Length of time on the road traveling to all the different schools.
- Mileage on my car, and bad roads in the winter time.
- Budget limitations, and cutting some activities.

Significant Experiences with the HOF Program

- Every time I go into a classroom, there's always at least one very, very good question.
- Thank you notes from the classrooms at the end of the year.
- Satisfaction with the looks of the students' faces and the teachers.
- Mainly when a kid catches their first fish, that's my goal, and that's what keeps me going.
- Watching people's impressions of fish and fishing change, especially with the fish dissection program, where you have people who are afraid to touch end up being the people who are digging in.
- I've seen students 4, 5, 6 years later and they remember me. They tell me how cool they thought that [program] was.
- When I'm somewhere, and I don't expect it, and a kid comes up and remembers my name, or says "hello, do you remember me, I was in this class that you taught?".
- Telephone calls from parents after their children went through the fishing day, and they were really, really appreciative of what that [experience] did for their child. You know you did something because the kid brought it home.
- Made true friends in the schools and also with employees of FWP really went out of their way to help us.
- The (particular) school district was an exceptional experience because of the parents' support and the grandparents that came in.

- Helps with my retirement [from teaching], because I still get to work with children.

Judge the Success of HOF Program

- Feedback from teachers, parents, community, media, school administrators.
- Student and teacher enthusiasm, smiles, and good questions.
- Thank you letters.
- Stories about fishing experiences beyond the school program.
- Low school attrition, repeat invitations from teachers.
- Program growth, new schools involved.

Challenges of Being a HOF Instructor

The instructors expressed the element of balancing time and scheduling, adapting teaching methods to the different age levels and styles of the classroom teachers, having each student catch a fish, and becoming familiar with the different topic areas covered in the program.

Suggested Changes to Improve the HOF Program

- Have more unity in the program materials, make them less subjective.
- Have a more uniform instructor's manual.
- Develop an activity for all students to write invitations to someone from their family to join and participate in the fishing trips.
- Get to know the students better.

- Need more time for the fall teachers' workshop to inform teachers about the program and what the needs are for working with the instructors to provide an effective program.
- To always have at least one hour for each lesson.
- Like to see more program publicity to make more people aware of the program.
- See the program expand into more schools.
- Like to have someone on contract that would be more available to work intensely on expanding the program.

Suggested Ways to Make Program Changes

- Start the program at the beginning of the school year, and do fish dissection and anatomy right away.
- Work with schools to have them put more effort into pulling together the poles and the tackle boxes and being prepared.
- Have a coordinated meeting to get ideas for program development, compile them, and field test across the State.
- Have pre-study activities. Example: The Missouri River Adopt-a-Fish is great, because the resources and themes can be introduced electronically; it prepares a class for making better use of an instructor's time.
- More time and money; could do more programs within the school year.

Recommendations for Future HOF Instructors

- Relax, enjoy what you are doing, and have fun.
- Be prepared, confident, and know how to handle a classroom situation.
- Observe, assist, and work with an experienced instructor.
- Have patience.
- Communicate with school administrators and staff.
- Prepare the rods and reels yourself; don't rely on teachers and students to do it.
- Make the outdoor experience a priority.

Suggestions to Improve the HOF Program

- Wish we would do a better job of sharing the stuff that works really well and eliminating the things that don't work really well, just fine tuning.
- Preserve the program's flexibility. Important to have consistent program standards and outcomes across the State, but be able to change the context of the activities to fit a single classroom's needs or a part of the state, so the information is relevant to the students' locality.
- Sit down and visit with other people about what they're doing and come up with a general outline or guidebook we could all follow or use as a resource. It would just be nice to look at it more comprehensively as a state.
- Have more instructors.

- Need to convince administrators and school boards that this is a program that students are going to remember forever.
- Need to have a name badge so school administrators and others know who the instructors are and why they are in the school.
- Need to have money to keep all these activities going.
- Pre-visit plan and activities, so the students know what they are going to be doing when the instructor arrives. Also post-visit activities.
- Have a supervisor in each region, or in the state, for only the HOF program, so they're not strapped for all the other educational programs.

Final Comments

- Really happy to hear that the theme for the program is "Hooked on Fishing", instead of "Hooked on Fishing, Not On Drugs".
- Would be nice to have a more standard brand for the program and everybody around the state went with that. Maybe a logo and name that went with it that was the same.
- It would be great if we could exchange some experiences with another state.
- Emphasize the ethics more.
- The identification badge, or some form of identification.
- Have more parents come in and help.
- Would hate to see it [the program] diminish because of a lack of funds or instructors.

- Every program has to have funding. It gets to be tougher and tougher all the time.

Appendix G

- Example of Spearman Correlation Analysis

Spearman Correlation: the calculated relationship between the variable, "frequency of outdoor experiences", and skill outcome variable "How well do you know how to clean up the area where you fish?" In the analysis, Spearman correlation (r_s) measured positive associations, with correlation coefficients ranging from minimal (r_s = 0.10) to typical (r_s = 0.30) strengths. The correlations coefficient was calculated for each category, but each was highly significant. Therefore, it was evident there was a narrow range of strength to the association between variables, but could not deduce which frequency had the most effect on the outcome variable.

Q34 Pre - cleaning up the area where you fish * PostQ31 Post - cleaning up the area where you fish * ExpTreat How did student participate in HOF program 2005-06 Crosstabulation

Count

ExpTreat How did student participate in HOF program 2005-06			PostQ31 Post - cleaning up the area where you fish				
			1 don't know how at all	2 not very well	3 pretty well	4 very well	Total
2 HOF CLASS ONLY	Q34 Pre - cleaning up the area where you fish	1 don't know how at all	3	0	1	1	5
		2 not very well	1	3	5	2	11
		3 pretty well	3	3	17	15	38
		4 very well	1	6	17	43	67
		Total	8	12	40	61	121
3 HOF CLASS + 1 OUTDOOR	Q34 Pre - cleaning up the area where you fish	1 don't know how at all	5	2	3	10	20
		2 not very well	1	5	14	10	30
		3 pretty well	1	7	62	60	130
		4 very well	3	7	46	229	285
		Total	10	21	125	309	465
4 HOF CLASS + 2 to 3 OUTDOOR	Q34 Pre - cleaning up the area where you fish	1 don't know how at all	9	11	9	8	37
		2 not very well	2	9	38	20	69
		3 pretty well	4	11	120	149	284
		4 very well	2	14	93	416	525
		Total	17	45	260	593	915
5 HOF CLASS + 4 or 5 OUTDOOR	Q34 Pre - cleaning up the area where you fish	1 don't know how at all	0	2	0	0	2
		2 not very well	0	2	2	4	8
		3 pretty well	2	4	27	30	63
		4 very well	0	2	35	113	150
		Total	2	10	64	147	223
6 HOF CLASS + 6 or more OUTDOOR	Q34 Pre - cleaning up the area where you fish	1 don't know how at all		0	0	1	1
		2 not very well					
		3 pretty well		0	4	3	7
		4 very well		1	4	15	20
		Total		1	8	19	28

ExpTreat How did student participate in			Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
2 HOF CLASS ONLY	Interval by Interval	Pearson's R	.403	.097	4.808	.000[c]
	Ordinal by Ordinal	Spearman Correlation	.356	.086	4.151	.000[c]
	N of Valid Cases		121			
3 HOF CLASS + 1 OUTDOOR	Interval by Interval	Pearson's R	.369	.058	8.537	.000[c]
	Ordinal by Ordinal	Spearman Correlation	.375	.045	8.706	.000[c]
	N of Valid Cases		465			
4 HOF CLASS + 2 to 3 OUTDOOR	Interval by Interval	Pearson's R	.443	.037	14.931	.000[c]
	Ordinal by Ordinal	Spearman Correlation	.394	.032	12.942	.000[c]
	N of Valid Cases		915			
5 HOF CLASS + 4 or 5 OUTDOOR	Interval by Interval	Pearson's R	.369	.072	5.909	.000[c]
	Ordinal by Ordinal	Spearman Correlation	.316	.068	4.944	.000[c]
	N of Valid Cases		223			
6 HOF CLASS + 6 or more OUTDOOR	Interval by Interval	Pearson's R	.042	.164	.214	.832[c]
	Ordinal by Ordinal	Spearman Correlation	.192	.192	.996	.328[c]
	N of Valid Cases		28			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Compare Spearman Correlation results above to McNemar-Bowker Test results below when controlling for the same variable.

Chi-Square Tests

ExpTreat How did student participate in		Value	df	Asymp. Sig. (2-sided)
2 HOF CLASS ONLY	McNemar-Bowker Test	4.625	6	.593
	N of Valid Cases	121		
3 HOF CLASS + 1 OUTDOOR	McNemar-Bowker Test	9.814	6	.133
	N of Valid Cases	465		
4 HOF CLASS + 2 to 3 OUTDOOR	McNemar-Bowker Test	40.649	6	.000
	N of Valid Cases	915		
5 HOF CLASS + 4 or 5 OUTDOOR	McNemar-Bowker Test	5.718	5	.335
	N of Valid Cases	223		
6 HOF CLASS + 6 or more OUTDOOR	McNemar-Bowker Test	.	.	.[a]
	N of Valid Cases	28		

a. Both variables must have identical values of categories.

Appendix H

- Survey Questions Selected for Research Purpose

Table 25.
Listing of selected survey questions for student outcome analyses.

Outcomes [a]	Question [b]
Attitudes	Q8[c] - Think about fish
	Q9[c] - Think about outdoor activities
	Q10[c] - Learn more about fish & water
	Q11[c] - Learn science in the classroom
	Q12[c] - Learn science in the classroom and the outdoors
	Q13[c] - How do you care about fish
	Q14[c] - How do you feel about fishing
Behaviors	Q15a[c] - Visit and explore places such as creeks, ponds, lakes & wetlands
	Q15b[c] - Help take care of places in your area where plants, fish and wildlife live
	Q15c[c] - How things you do might affect plants, fish, and wildlife that live in or near water
	Q15d[c] - Use water carefully
	Q15e[c] - Help make sure that people in the future have clean water to drink
	Q15f[c] - Help make sure that people in the future have places to enjoy the outdoors
Skills	Q24[c] - Reading and knowing the fishing laws before fishing
	Q25[c] - Carefully, handling a fish you have caught
	Q26[c] - Carefully, releasing a fish you catch
	Q27[c] - Carefully, cleaning (or gutting) the fish you catch
	Q28[c] - Correctly, identifying different kinds of fish

Table 25 (continued).
Listing of selected survey questions for student outcome analyses.

Outcomes [a]	Question [b]
Skills continued	Q29[c] - Using different kinds of fishing equipment
	Q31[c] - Casting your fishing line into the water
	Q32[c] - Tying good fishing knots in your fishing line
	Q33[c] - Ice fishing
	Q34[c] - Cleaning up the area where you fish
	Q35[c] - Following the fishing laws when fishing
Knowledge	Q37[c] - Montana fishing laws
	Q38[c] - The different native and not (non) native fish in Montana
	Q39[c] - The different names of fish found in Montana waters
	Q40[c] - The things that make good habitat for fish
	Q41[c] - The importance of clean water to people, plants, and animals
	Q44[c] - The body parts of a fish, and what they do for the fish
	Q45[c] - The jobs that people have that work with fish and wildlife in Montana
	Q46[c] - The jobs that people have that work with science and the natural world

Note.
[a] Student outcomes
[b] Questions selected for research study purposes only. See Appendix B, pp. 184 - 190 to view all student survey questions. Questions are numbered according to pre-survey format.
[c] Questions selected as key attributes of student outcomes for the HOF treatment.